R 24/2/app.

THIRD REPORT OF THE COMMISSION ON MERCHANT MARINE AND DEFENSE: APPENDICES

SEPTEMBER 30, 1988

Y3.M53/2:2

APPENDICES

Appendix A: Synopsis of Commission Public Hearings..............1

Appendix B: United States Merchant Marine and Other Strategic Sealift Resources.......................9

Appendices B-1 and B-2: Total United States Flag Merchant Fleet..................................10

Appendix B-1: Total United States Flag Fleet in Number of Ships.............................11

Appendix B-2: Total United States Flag Fleet in Deadweight Tons.............................12

Appendices B-3 and B-4: United States Flag Militarily Useful Ships....................................13

Appendix B-3: United States Flag Militarily Useful Dry Cargo Ships................................14

Appendix B-4: United States Flag Militarily Useful Tankers..15

Appendices B-5 and B-6: Strategic Sealift Assets...........16

Appendix B-5: Strategic Sealift Assets: Militarily Useful Dry Cargo Ships..............17

Appendix B-6: Strategic Sealift Assets: Militarily Useful Tankers......................18

Appendix B-7: Ship Listings -- July 1988...................19

Appendix B-8: Disposition of Former United States Lines Ships................................40

Appendix B-9: Comparison of United States Ship Operating Companies, 1970 and 1987.........44

Appendix C: United States Seagoing Labor.......................57

Appendices C-1 and C-2: Summary of Seagoing Labor..........58

Appendix C-1: Summary of Seagoing Labor -- 1988.......63

Appendix C-2: Summary of Seagoing Labor -- Year 2000..64

Appendix C-3: 1988 Manpower Lists by Fleet.................66

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

READEX FICHE best copy available

Appendix D: United States Shipbuilding and Ship Repair Industry........................87

Appendix D-1: Open Shipyards, Ship Repair Facilities, and Boat Yards Data Base..................88

Appendix D-2: Closed United States Shipyards: 1980 to 1988..............................135

Appendix D-3: Sealift Enhancement Features (SEF)..........146

Appendix D-4: Projected Shipyard Workload.................150

Appendix E: Staff Papers......................................153

Appendix E-1: United States Trade and the Merchant Marine..........................154

Appendix E-2: The Tax Reform Act of 1986 and Its Effect on the United States Merchant Marine......160

Appendix E-3: Barriers to Liner Transportation Services...178

Appendix E-4: Better Ships Are Important Too: Innovation in the United States Maritime Industries..186

Appendix E-5: Intermodalism..............................222

Appendix E-6: Ship Registry Issues.......................228

Appendix E-7: The United Nations Conference on Trade and Development Code of Conduct for Liner Conferences.............................235

Appendix E-8: Prepositioning: Objectives, Status, and Effects...................................244

Appendix E-9: Containerization: Its Potential and Implications for Military Requirements....249

Appendix E-10: Observations on the Readiness of United States Ports for Strategic Mobility Missions........................254

Appendix E-11: Military Sealift Command Tanker Scheduling Practices...............................261

Appendix E-12: Mobilization Manning Considerations.........263

Appendix E-13: United States Shipyard Mobilization Base....272

Appendix F: The Commission - Enabling Legislation.............281

The Commissioners and Staff....................................285

APPENDIX A

SYNOPSIS OF COMMISSION PUBLIC HEARINGS

APPENDIX A

SYNOPSIS OF COMMISSION PUBLIC HEARINGS

PUBLIC HEARINGS IN WASHINGTON, D.C.

1. May 23 and 24, 1988

Witnesses from a broad spectrum of interests among merchant ship operators and maritime labor, and other witnesses concerned with the state of the United States maritime industries, presented testimony on the subject "Improving the Competitiveness of the United States Flag Merchant Marine," and provided their opinions on the value of, and likelihood for, implementing the recommendations presented in the Commission's second report. The witnesses were:

Panel for the United Shipowners of America:

- Mr. William Verdon, President, United Shipowners of America;
- Mr. Peter Finnerty, Vice President, Sea-Land Corporation;
- Mr. Jack Park, Vice President, Governmental Relations, Crowley Maritime Corporation; and
- Mr. William Brierre, Senior Vice President, Lykes Bros. Steamship Co., Inc.

Mr. Philip Shapiro, Vice President and General Counsel, Apex Marine Corporation, accompanied by Mr. Thomas Mills, Counsel, Apex Marine Corporation;

Mr. Edward Merrigan, Washington Representative, Central Gulf Lines, representing Mr. Erik F. Johnsen, President, Central Gulf Lines, Inc.;

Mr. Andrew Gibson, Chairman of the Board, American Automar, Inc., and former Assistant Secretary of Commerce for Maritime Affairs;

Mr. Ole Skaarup, President, Skaarup Shipping Corporation;

Admiral Harold Shear, USN (Ret.), former Maritime Administrator;

Captain Robert J. Lowen, President, International Organization of Masters, Mates, and Pilots;

Mr. Talmage E. Simpkins, Executive Director, AFL-CIO Maritime Committee; and

Mr. Edward Kelly, representing Mr. Raymond T. McKay, President, Marine Engineers Beneficial Association, District 2, accompanied by Mr. Gerald Joseph, Vice President, Marine Engineers Beneficial Association, District 2.

2. May 24, 1988

Witnesses representing shipbuilders, ship operators and the containerized cargo industry, and witnesses with special expertise in other maritime matters, presented testimony before the Commission on the subject: "Obtaining, Sustaining, and Modernizing Ships for Strategic Sealift," and provided their opinions on the value of, and likelihood for, implementing the recommendations contained in the Commission's second report. The witnesses were:

Mr. John J. Stocker, President, Shipbuilders Council of America;

Mr. Philip J. Loree, Chairman, Federation of American Controlled Shipping;

Mr. Richard A. Lidinsky, Jr., Vice President, Governmental Affairs, Sea Containers America Inc.;

General Paul F. Gorman, USA (Ret.), Consultant; and

Mr. Reed O. Clark, President, Pacific Basin Chartering, Inc.

3. July 18, 1988

Witnesses representing a broad spectrum of maritime interests, including academia, the shipbuilding industry, ship operators, ship designers, management consultants, and the public at large, presented testimony on the subject "Maintaining, Modernizing, and Strengthening the Shipbuilding, Ship Repair, and Shipyard Supplier Industrial Base," and provided their opinions of the value of, and likelihood for, implementing the recommendations in the Commission's second report. The witnesses were:

Mr. Gerald Seifert, General Counsel for Maritime Policy, House Committee on Merchant Marine and Fisheries, testifying as a private individual;

Mr. Howard M. Bunch, Associate Professor, Department of Naval Architecture and Marine Engineering, University of Michigan;

Dr. Clinton H. Whitehurst, Jr., Senior Fellow, Strom Thurmond Institute, Clemson University;

Mr. David H. Klinges, President, Marine Construction Division, Bethlehem Steel Corporation;

Mr. A. Leonard Course, Manager, Maintenance and Repair Division, Chevron Shipping Company;

Mr. M. Leigh Whitney, Senior Vice President, Government Systems, Philip Crosby Associates; and

Mr. Lester Rosenblatt, P.E., N.A., Chairman and Chief Executive Officer, M. Rosenblatt & Son, Inc.

4. July 20, 1988

Witnesses representing coastal and riverine ship operators, seagoing ship operators, foreign flag-of-convenience shipping registries, port operators, cargo shippers, and the Department of Commerce presented testimony on the subject "Providing Cargo and Access to Cargo for the United States Merchant Marine" and provided their opinions of the value of, and likelihood for, implementing the recommendations contained in the Commission's second report. The witnesses were:

Mr. Joseph A. Farrell, III, President, The American Waterways Operators;

Mr. Ernest J. Corrado, President, American Institute of Merchant Shipping;

Mr. William Verdon, President, United Shipowners of America;

Mr. Michael Hanson, Vice President, Vanuatu Maritime Services, Inc.;

Mr. Davis Helberg, U.S. Chairman, International Association of Great Lakes Ports, and Executive Director, Seaway Port Authority of Duluth;

Mr. H. George Miller, Executive Director, Shippers for Competitive Ocean Transportation, accompanied by Mr. John Baisley, Director, Materials Transportation, General Motors Corporation, and Mr. Michael Berzon, Manager, International Transportation Procurement, E.I. du Pont de Nemours & Company;

Mr. Thomas Wyman, Manager, Government and Public Affairs Division, Chevron Shipping Company, on behalf of the American Petroleum Institute;

Mr. William G. Stewart, Vice President, Materials and Distribution, Union Camp Corporation; and

Dr. John Hayes, Assistant Director, "Export Now," United States Department of Commerce.

REGIONAL HEARINGS

1. Jacksonville, Florida: July 14, 1988

Witnesses presented testimony before the Commission's Chairman, Senator Jeremiah Denton, about the problems and prospects of the maritime industries in the Southeastern Atlantic Coast region. The witnesses were:

Mr. James E. Hodge, Chairman, Jacksonville Port Authority, accompanied by Paul DeMariano, Managing Director, Jacksonville Port Authority;

Mr. Bill Hodges, Administrative Aide, Office of the Mayor, Jacksonville, Florida;

Mr. Thomas P. Jones, Jr., Vice President Government Affairs, Atlantic Marine, Inc., and Vice President Government Affairs, Atlantic Dry Dock Corporation;

The Honorable Corrine Brown, Florida State Representative, District 17;

Vice Admiral T. R. Kinnebrew, USN (Ret.), Vice President, Government Affairs, Jacksonville Shipyards, Inc.; and

Mr. Charles F. Spencer, President, Local 1408, International Longshoreman's Union, AFL-CIO

2. Norfolk, Virginia: August 23, 1988

Witnesses presented testimony before Commissioner James L. Holloway, III, Admiral, USN (Ret.), about the problems and prospects of the maritime industries in the Tidewater area of Maryland, Virginia, and North Carolina. The witnesses were:

The Honorable Owen B. Pickett, Member of Congress from the 2nd District of Virginia;

Mr. John D. Covaney, Senior Managing Director of Marketing Services, Virginia Port Authority;

Vice Admiral Vincent A. Lascara, SC, USN (Ret.), and Mr. Dana Gray, representing the South Tidewater Association of Ship Repairers;

Mr. Thomas L. Ackiss, Vice President, Lyon Shipyard, Inc.;

Mr. Alyn Fife, representing the Propeller Club of Newport News;

Captain Howard Sandefer, Master, M.V. RAINBOW HOPE; and

Mr. Ronald E. Ault, Assistant Directing Business Representative, District Lodge 74, International Association of Machinists and Aerospace Workers.

3. Seattle, Washington: August 31, 1988

Witnesses presented testimony before Commissioners Edward E. Carlson and Shannon J. Wall about the problems and prospects of the maritime industries in the Pacific Northwest region. The witnesses were:

The Honorable Norman D. Dicks, Member of Congress from the 6th District of Washington;

The Honorable Mike Lowry, Member of Congress from the 7th District of Washington;

The Honorable John Miller, Member of Congress from the 1st District of Washington;

The Honorable Don Bonker, Member of Congress from the 3rd District of Washington;

Mr. David Moseley, Director, Seattle Department of Community Development, representing the Honorable Charles Royer, Mayor of Seattle;

Ms. Pat Richardson, representing the Honorable Slade Gorton, former United States Senator from the State of Washington;

Mr. William H. Zavin, II, President, Northwest Marine Iron Works;

Mr. James F. Kruger, on behalf of Councilwoman Cynthia Sullivan, Chairman, Puget Sound Shipyard Industrial Jobs Commission;

Mr. Michael Alvine, Senior Development Specialist, Planning and Community Development Division, King County, Washington;

Ms. Gwen Fraser, Chairman, Maritime Alliance of the Pacific Northwest;

Rear Admiral E. D. Stanley, Jr., SC, USN (Ret.), Chairman, Merchant Marine Committee, Maritime Alliance of the Pacific Northwest;

Mr. Jim Tusler, Labor Liaison, Dislocated Worker Project, Washington State Labor Council, AFL-CIO, accompanied by Mr. Nate Ford, President, Seattle Metal Trades Council, and Mr. Bill Carpine, Secretary/Treasurer, Seattle Metal Trades Council;

Captain John H. File, Vice President, Seattle Pacific Northwest Chapter of the Council of Master Mariners;

Mr. William Jenkins, General Manager, Fraser Boiler and Diesel, Inc.;

Mr. Louis Chirillo, Chairman, Panel SP-2, Ship Production Committee, Society of Naval Architects and Marine Engineers, and Manager, Government/Industry National Shipbuilding Research Program;

Mr. Philip F. Spaulding, Naval Architect, former Chairman of the Board, Nickum and Spaulding Associates; and

Mr. Ralph J. Staehli, Jr., former seagoing merchant mariner.

At the time of this report, a hearing was scheduled for October 17, 1988, in New York City, before Commissioner Shannon J. Wall, about the problems and prospects of the maritime industries in the Northeast region. Additional public hearings in Long Beach, California, and New Orleans, Louisiana, were under consideration to gather information and opinions from individuals and organizations in the Pacific Southwest and Gulf Coast regions.

APPENDIX B

UNITED STATES MERCHANT MARINE AND OTHER STRATEGIC SEALIFT RESOURCES

APPENDICES B-1 AND B-2

TOTAL UNITED STATES FLAG MERCHANT FLEET

Appendices B-1 and B-2 list the numbers and deadweight tonnages of the active and idle United States flag commercial oceangoing ships as of January 1987 and July 1988 and as projected for January 2000. The projection is based on the Maritime Administration forecast for the year 2000, which assumes that current government policies and programs will not change. The Military Sealift Command provided estimates for the ships expected to be under charter in the year 2000.

The number of ships currently and projected to be on charter to the Military Sealift Command is also shown in parentheses in Appendix B-1.

The eleven United States flagged, Kuwaiti owned tankers and laid-up vessels in Maritime Administration custody (Ready Reserve Force, National Defense Reserve Fleet, and Title XI defaults) are not included.

Appendix B-7 contains a description of the ship type abbreviations used in Appendices B-1 and B-2.

APPENDIX B-1

TOTAL UNITED STATES FLAG MERCHANT FLEET IN NUMBERS OF SHIPS

TYPE	JANUARY 1987 (ACTUAL)	JULY 1988 (ACTUAL)	JANUARY 2000 (PROJECTED)
DRY CARGO:			
BREAKBULK/CONT-BB	47 (8)	36 (8)	6 (6)
CONTAINER SHIPS	94	87	47
CONTAINER BULK	0	1	5
CONTAINER RO-RO	8 (1)	7 (1)	9 (2)
CAR CARRIERS	0	4	6
RO-RO	22 (2)	17 (2)	8 (2)
RO-RO (MPS)	13 (13)	13 (13)	13 (13)
BARGE TRANSPORTS	11 (4)	10 (4)	5 (5)
CONTAINER/PASSENGER	3	0	0
FLO-FLO	1 (1)	1 (1)	1 (1)
SUBTOTAL	199 (29)	176 (29)	100 (29)
TANKERS:			
PETROLEUM			
UNDER 100,000 DWT COATED	148 (24)	138 (24)	55 (23)
UNDER 100,000 DWT UNCOATED	12	9	2
OVER 100,000 DWT	33	34	22
SUBTOTAL	193	181	79
SPECIAL PRODUCT			
LNG/LPG	11	12	12
CHEMICAL/OTHERS	12	10	1
SUBTOTAL	23	22	13
BULK:	26	26	22
PASSENGER:	4	4	3
GRAND TOTAL	445 (53)	409 (53)	217 (52)

APPENDIX B-2

TOTAL UNITED STATES FLAG MERCHANT FLEET IN DEADWEIGHT TONS

SHIP TYPE	JANUARY 1987 (ACTUAL)	JULY 1988 (ACTUAL)	JANUARY 2000 (PROJECTED)
DRY CARGO:			
BREAKBULK/CONT-BB	651,142	503,550	91,610
CONTAINER SHIPS	2,564,219	2,570,180	1,744,064
CONTAINER BULK	0	54,665	273,325
CONTAINER RO-RO	186,761	176,012	233,032
CAR CARRIERS	0	53,288	98,026
RO-RO	323,097	258,232	121,999
RO-RO (MPS)	322,396	322,396	322,396
BARGE TRANSPORTS	410,072	380,272	197,869
CONTAINER/PASSENGER	27,849	0	0
FLO-FLO	51,254	51,272	51,272
SUBTOTAL	4,536,790	4,369,867	3,133,593
TANKERS:			
PETROLEUM			
UNDER 100,000 DWT COATED	6,584,200	6,246,600	2,137,100
OVER 100,000 DWT UNCOATED	583,900	435,100	97,200
OVER 100,000 DWT	6,366,900	6,676,038	4,759,538
SUBTOTAL	13,535,000	13,357,738	6,993,838
SPECIAL PRODUCT			
LNG/LPG	737,100	816,300	865,100
CHEMICAL/OTHERS	338,500	298,700	49,500
SUBTOTAL	1,075,600	1,115,000	914,600
BULK:	1,265,625	1,265,625	1,061,139
PASSENGER:	33,507	33,507	20,698
TOTAL	20,446,522	20,141,737	12,123,868

APPENDICES B-3 AND B-4

UNITED STATES FLAG MILITARILY USEFUL SHIPS

Appendices B-3 and B-4 list the numbers and deadweight tonnages of the United States flag dry cargo ships and tankers that are militarily useful under the definition established by the Joint Chiefs of Staff. As indicated in Appendix 1 of the First Report of the Commission on Merchant Marine and Defense: Findings of Fact and Conclusions, dated September 30, 1987, the Joint Chiefs of Staff define militarily useful ships as:

> All oceangoing general cargo ships of over 6,000 deadweight tons; certain dry cargo ships of under 6,000 deadweight tons with special military features (such as heavy lift ships and float-on/float-off cargo ships, etc.); tankers (including chemical tankers but excluding molten sulphur, asphalt, and liquid natural gas tankers and other uniquely specialized ships) of 6,000 to 100,000 deadweight tons and with a beam of less than 106 feet and capable of handling or being modified to handle refined petroleum products; and oceangoing passenger ships (excluding ferries).

The data show active and idle commercial ships, and ships on charter to the Military Sealift Command.

The inactive fleet includes the ships of the Military Sealift Command's Reduced Operating Status (ROS) fleet, the Ready Reserve Force (RRF), and the National Defense Reserve Fleet (NDRF).

The projection for the ships in the inactive fleets is based on Navy's latest programmed levels for the ROS and RRF. The Commission staff estimated the size of the NDRF for the year 2000 by assuming that all United States flag dry cargo ships less than 40 years old and tankers less than 35 years old would be placed in the NDRF when retired from the active fleet.

The eleven United States flagged, Kuwaiti owned tankers are not included in the totals.

APPENDIX B-3

UNITED STATES FLAG MILITARILY USEFUL DRY CARGO SHIPS

SHIPS AND (DEADWEIGHT TONS)

	JANUARY 1987 (ACTUAL)	JULY 1988 (ACTUAL)	JANUARY 2000 (PROJECTED)
ACTIVE FLEET:			
COMMERCIAL	170 (3,828,932)	147 (3,674,554)	71 (2,394,134)
MSC CHARTERS	29 (707,858)	29 (695,313)	29 (739,459)
SUBTOTAL	199 (4,536,790)	176 (4,369,867)	100 (3,133,593)
INACTIVE FLEET:			
MSC (ROS)	10 (229,482)	10 (229,482)	10 (229,482)
RRF	77 (1,274,347)	81 (1,381,891)	100 (1,823,239)
NDRF	125 (1,478,424)	116 (1,379,887)	108 (1,741,450)
SUBTOTAL	212 (2,982,253)	207 (2,991,260)	218 (3,794,171)
TOTAL	411 (7,519,043)	383 (7,361,127)	318 (6,927,764)

APPENDIX B-4

UNITED STATES FLAG MILITARILY USEFUL TANKERS

SHIPS AND (DEADWEIGHT TONS)

	JANUARY 1987 (ACTUAL)		JULY 1988 (ACTUAL)		JANUARY 2000 (PROJECTED)	
ACTIVE FLEET:						
COMMERCIAL	144	(6,880,400)	130	(6,186,000)	33	(1,592,000)
MSC CHARTERS	24	(720,700)	24	(720,700)	23	(685,600)
SUBTOTAL	168	(7,601,100)	154	(6,906,700)	56	(2,277,600)
INACTIVE FLEET:						
RRF	8	(112,228)	9	(202,725)	32	(1,007,060)
NDRF	10	(285,519)	19	(590,714)	18	(1,036,442)
SUBTOTAL	18	(397,747)	28	(793,439)	50	(2,043,502)
TOTAL:	186	(7,998,847)	182	(7,700,139)	106	(4,321,102)

APPENDICES B-5 AND B-6

STRATEGIC SEALIFT ASSETS

Appendices B-5 and B-6 list the numbers of militarily useful dry cargo ships and tankers available from all sources to meet United States military sealift requirements in 1987 and 1988, and the ships expected to be available in the year 2000. The sources are United States flag ships in both the active and inactive fleets, including active and idle commercial and MSC charters; the "Effective U. S. Controlled" or "EUSC" fleet; NATO ships committed under the NATO rapid reinforcement plan for Europe; and allied ships committed for the defense of Northeast Asia.

The current agreements for the provision of NATO and other allied ships are assumed to continue through the year 2000.

APPENDIX B-5

STRATEGIC SEALIFT ASSETS: MILITARILY USEFUL DRY CARGO SHIPS

	JANUARY 1987 (ACTUAL)	JULY 1988 (ACTUAL)	JANUARY 2000 (PROJECTED)
UNITED STATES FLAG:			
ACTIVE	199	176	100
INACTIVE			
RRF	77	81	100
NDRF	125	116	108
MSC (ROS)	10	10	10
EUSC:	22	19	5
NATO:	400	400	400
OTHER ALLIED:	25	25	25
TOTAL:	858	827	748

APPENDIX B-6

STRATEGIC SEALIFT ASSETS: MILITARILY USEFUL TANKERS

	JANUARY 1987 (ACTUAL)	JULY 1988 (ACTUAL)	JANUARY 2000 (PROJECTED)
UNITED STATES FLAG:			
ACTIVE	168	154	56
INACTIVE			
RRF	8	9	32
NDRF	10	19	18
EUSC:	101	99	48
NATO:	58	58	60
OTHER ALLIED:	0	0	0
TOTAL	345	339	214

APPENDIX B-7

SHIP LISTINGS - JULY 1988

The attached lists contain an inventory, as of July 1988, of the oceangoing ships in the United States flag fleet (including vessels under Military Sealift Command charter), the Ready Reserve Force, the militarily useful ships in the National Defense Reserve Fleet, and the "Effective U.S. Controlled Fleet."

The names and principal characteristics are provided for dry cargo ships, tankers, dry bulk ships, and passenger ships. The lists include all ships that are 6,000 deadweight tons (DWT) or greater, as well as some smaller ships with special military features. The eleven United States flagged, Kuwaiti owned merchant ships are not included.

TERMINOLOGY:

Characteristics:

FLAG - For "Effective United States Controlled" ships ("EUSC") only; a two character abbreviation of the flag of registry of the ship (BA = Bahamas; HO = Honduras; LI = Liberia; PA = Panama).

RGE - The range of the ship in hundreds of nautical miles.

DWT(L/T) - Deadweight tonnage of the ship in long (2,240 pounds) tons .

CARGO DWT(S/T) - Cargo deadweight capacity of the ship in short tons (2,000 pounds).

TEU - Container capacity of ships carrying containers, in 20 foot container equivalent units.

SQ.FT.(RO-RO) - Square foot capacity of Roll-on/Roll-off ships.

SQ.FT. - Available square footage below decks on breakbulk and partial container ships.

MEAS. TONS - Measurement tonnage capacity of the ship (one measurement ton is equal to 40 cubic feet).

MEAS. TONS CONT - Measurement tonnage of the container capacity of the ship, based on 28.625 measurement tons per TEU.

TANKER BBLS - Liquid capacity of tankers expressed in barrels (42 gallons per barrel).

MILUSE - Coded "Y" (yes) for those tankers that meet the criteria for being militarily useful as defined by the Department of Defense.

Ship Type Abbreviations:

BARGE TRAN - Barge Transport Ship (either LASH or SEABEE)

BREAKBULK - Vessel designed to carry breakbulk cargo and capable of loading and unloading that cargo with its own equipment.

CHEMICAL - Tanker designed to carry bulk chemical products.

COASTAL - Small tanker designed for use in inland or coastal waters only.

CONT-BB - Container/Breakbulk Ship

CONT-BULK - Container/Bulk Ship

CONT-NSS - Non Self-Sustaining Containership

CONT-SS - Self-Sustaining Containership

CONT RO-RO - Container Roll-on/Roll-off Ship

CRUDE - Tanker used to carry crude petroleum products.

FLO-FLO - Float-on/Float-off Ship

FSS - Fast Sealift Ship (T-AKR)

ITB - Integrated Tug-Barge

LNG - Liquefied natural gas carrier

LPG - Liquefied petroleum gas carrier

OBO - Ore/Bulk/Oil Ship

PRODUCT - Tanker used to carry refined petroleum products.

MPS - Maritime Prepositioning Ship

RO-RO - Roll-on/Roll-off Ship

T-ACS - Auxiliary Crane Ship

T-AVB - Aviation Intermediate Maintenance and Supply Ship

JULY 1988 U.S. FLAG DRY CARGO FLEET

COMMERCIAL:

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	RGE (X00)	DWT(L/T)	DWT(S/T) CARGO	TEU	SC.FT. (RO-RO)	SC.FT.	MEAS TONS	MEAS TONS CONT	NOTES
AMERICAN KESTREL	BARGE TRAN	74.4	22.5	120	29,820	24,602				30,380		1, 3
AMERICAN VETERAN	BARGE TRAN	73.1	21.0	130	29,820	24,602				30,380		1, 3
LASH ATLANTICO	BARGE TRAN	74.4	22.5	120	29,820	24,602				30,380		1, 3
ROBERT E LEE	BARGE TRAN	74.2	22.0	150	40,921	33,760				43,610		1, 3
SAM HOUSTON	BARGE TRAN	74.3	22.0	150	40,921	33,760				43,610		1, 3
STONEWALL JACKSON	BARGE TRAN	74.2	22.0	150	40,921	33,760				43,610		1, 3
GALVESTON BAY	BREAKBULK	66.2	20.0	195	14,662	12,096			12,022	18,725		1, 3
GENEVIEVE LYKES	BREAKBULK	68.2	20.0	195	14,662	12,096			12,022	18,725		1, 3
ISLAND MARIANA	BREAKBULK	80.4	13.0	60	2,200	1,650			3,000	3,250		1, 3
LOUISE LYKES	BREAKBULK	65.3	20.0	120	14,700	12,096			12,022	18,725		1, 3
PRESIDENT CLEVELAND	BREAKBULK	69.4	20.8	140	22,180	18,299			17,000	25,450		1, 3
PRESIDENT TAYLOR	BREAKBULK	69.2	20.8	140	22,273	18,375			17,000	25,450		1, 3
RESOLUTE	BREAKBULK	44.0	10.5	120	6,147	4,918				6,125		1, 3
RUTH LYKES	BREAKBULK	66.2	20.0	195	14,662	12,096			12,022	18,725		1, 3
TAMPA BAY	BREAKBULK	66.3	20.0	195	14,662	12,096			12,022	18,725		1, 3
GREEN BAY	CAR CARRIER	87.4	18.0		13,500	16,600		300,000				
GREEN LAKE	CAR CARRIER	87.3	18.0		10,500			300,000				
MARINE RELIANCE	CAR CARRIER	87.2	18.0		11,492			429,914				
OVERSEAS JOYCE	CAR CARRIER	87.4	18.0		17,796			447,312				
LURLINE	CONT RO-RO	73.3	25.0	60	21,683	17,888	1,623	20,000			46,458	2
MATSONIA	CONT RO-RO	73.4	21.5	100	13,811		1,590	113,740			15,514	2
MAUNALEI	CONT RO-RO	44.3	17.0	200	17,898	14,766	959	7,500			27,451	2
SEA FOX	CONT RO-RO	85.1	18.0	180	34,163	19,883	1,928	10,000			55,189	4
SEA LION	CONT RO-RO	85.3	18.0	180	33,600	19,883	1,928	10,000			55,189	4
SEA WOLF	CONT RO-RO	84.4	18.0	180	34,163	19,883	1,928	10,000			55,189	4
ALLISON LYKES	CONT-BB	64.3	21.0	140	15,900	13,072	521		15,000	10,691	14,901	1, 3
AMERICAN MONARCH	CONT-BB	69.2	23.0	120	13,074	10,786	805		15,000	19,125	23,023	1, 3
AMERICAN RESERVIST	CONT-BB	64.4	21.0	140	15,244	12,576	521		15,000	10,691	14,901	1, 3
AMERICAN SPITFIRE	CONT-BB	69.1	23.0	120	13,074	10,786	805		15,000	19,125	23,023	1, 3
AMERICAN TITAN	CONT-BB	68.3	23.0	120	13,074	10,786	805		15,000	19,125	23,023	1, 3
ASHLEY LYKES	CONT-BB	63.2	18.0	231	14,286	11,786	76		13,000	17,575	2,176	1, 3
EXPORT CHAMPION	CONT-BB	63.3	18.5	130	12,525	10,333	439		10,000	16,675	12,555	1, 3
JAMES LYKES	CONT-BB	60.1	17.4	210	14,286	11,786	246		13,000	17,575	7,042	1, 3
JEAN LYKES	CONT-BB	61.4	17.4	210	14,260	11,765	246		13,000	17,575	7,042	1, 3
JOHN LYKES	CONT-BB	60.3	17.4	223	14,260	11,765	246		13,000	17,575	7,042	1, 3
JOSEPH LYKES	CONT-BB	60.2	17.4	223	14,057	11,786	246		13,000	17,575	7,042	1, 3
LESLIE LYKES	CONT-BB	62.0	17.4	231	14,286	11,786	246		13,000	17,575	7,042	1, 3
MALLORY LYKES	CONT-BB	64.4	21.0	140	15,845	13,072	521		15,000	10,691	14,901	1, 3
MARJORIE LYKES	CONT-BB	62.0	18.0	231	14,260	11,765	246		13,000	17,575	7,036	1, 3
NANCY LYKES	CONT-BB	61.3	17.4	210	14,286	11,786	246		13,000	17,575	7,036	1, 3
STELLA LYKES	CONT-BB	65.1	21.0	140	15,900	13,072	521		15,000	10,691	14,091	1, 3
SUE LYKES	CONT-BB	69.3	20.3	140	22,211	18,324	490		17,000	25,450	14,014	1, 3
THOMPSON LYKES	CONT-BB	60.4	17.4	210	14,286	11,736	246		13,000	17,575	7,036	1, 3
ZOELLA LYKES	CONT-BB	60.3	17.4	223	14,286	11,786	246		13,000	17,575	7,036	1, 3
PRESIDENT TRUMAN	CONT-BULK	88.2	24.2	250	54,665		4,300				123,088	1, 4
ADABELLE LYKES	CONT-NSS	69.1	20.0	130	15,200	12,505	1,096				31,373	1, 3

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	RCE (X00)	DWT(L/T)	DWT(S/T) CARGO	TEU	SQ.FT. (RO-RO)	SQ.FT.	MEAS TONS	MEAS TONS COLT	NOTES
ALMERIA LYKES	CONT-NSS	68.1	23.0	150	17,477	14,419	1,094				31,316	1, 3
AMERICAN APOLLO	CONT-NSS	70.4	22.5	100	20,015	16,512	1,364				39,045	1, 3
AMERICAN AQUARIUS	CONT-NSS	71.1	22.5	100	20,105	16,587	1,364				39,045	1, 3
AMERICAN ASTRONAUT	CONT-NSS	69.2	22.5	100	20,484	17,334	1,326				37,957	1, 3
AMERICAN LANCER	CONT-NSS	68.2	22.5	100	22,200	17,334	1,290				36,926	1, 3
AMERICAN LYNX	CONT-NSS	68.4	22.5	100	20,400	17,334	1,326				37,957	1, 3
AMERICAN RESOLUTE	CONT-NSS	80.1	20.0	120	16,205	13,369	1,070				30,629	1, 3
ARGONAUT	CONT-NSS	79.2	22.4	120	16,142	13,317	1,070				30,629	1, 3
BORINQUEN	CONT-NSS	45.3	17.0	120	16,977	14,006	1,169				33,463	2
CHARLOTTE LYKES	CONT-NSS	68.4	19.5	130	15,154	12,439	1,104				31,602	1, 3
CHEASPEAKE BAY	CONT-NSS	85.4	18.0	260	34,841	27,918	2,411				69,015	4
DELAWARE BAY	CONT-NSS	85.3	18.0	260	34,841	28,570	2,306				66,009	4
EXPORT FREEDOM	CONT-NSS	72.3	20.0	120	16,343	13,483	1,070				30,629	1, 3
EXPORT PATRIOT	CONT-NSS	73.3	20.0	120	16,343	13,483	1,070				30,629	1, 3
GALVESTON BAY	CONT-NSS	85.1	19.2	300	57,942	47,802	4,258				121,886	4
HOWELL LYKES	CONT-NSS	67.3	23.0	150	17,512	14,447	1,094				31,316	1, 3
KAUAI	CONT-NSS	80.3	23.0	342	26,350	21,739	1,672				37,861	2
MANUKAI	CONT-NSS	70.1	23.0	357	27,074	22,336	1,664				47,632	2
MANULANI	CONT-NSS	70.3	23.0	357	27,074	22,336	1,664				47,632	2
MARGARET LYKES	CONT-NSS	68.0	19.0	158	15,772	12,505	1,096				31,373	1, 3
MASON LYKES	CONT-NSS	68.2	23.0	150	17,477	14,419	1,094				31,316	1, 3
MAUI	CONT-NSS	78.2	23.0	342	26,662	21,996	1,672				37,861	2
NEDLLOYD HOLLAND	CONT-NSS	84.2	18.2	300	58,620	46,937	4,258				121,886	4
NEDLLOYD HUDSON	CONT-NSS	85.2	20.0	300	58,620	46,938	4,258				121,836	4
NEWARK BAY	CONT-NSS	85.3	18.2	300	57,942	46,932	4,258				121,886	4
PRESIDENT ARTHUR	CONT-NSS	87.2	21.0		33,792	27,878	3,010				86,162	4
PRESIDENT BUCHANAN	CONT-NSS	87.2	21.0		33,792	27,878	3,010				86,162	4
PRESIDENT EISENHOWER	CONT-NSS	80.2	23.0	200	47,088	38,845	2,522				72,193	1, 3
PRESIDENT F D ROOSEVELT	CONT-NSS	80.2	23.0	200	47,079	38,605	2,522				72,193	1, 3
PRESIDENT GARFIELD	CONT-NSS	87.2	21.0		33,400	27,555	3,010				86,162	4
PRESIDENT GRANT	CONT-NSS	71.3	22.5	130	29,700	24,073	1,936				55,418	1, 3
PRESIDENT HARDING	CONT-NSS	87.2	21.0		33,400	27,555	3,010				86,162	
PRESIDENT HARRISON	CONT-NSS	71.4	22.5	271	29,749	24,543	1,930				55,246	1, 3
PRESIDENT HOOVER	CONT-NSS	71.3	22.5	363	29,749	24,543	1,936				55,418	1, 3
PRESIDENT JEFFERSON	CONT-NSS	73.1	23.0	178	20,700	17,092	1,484				42,480	1, 3
PRESIDENT JOHNSON	CONT-NSS	74.1	23.0	170	20,714	17,089	1,484				42,480	1, 3
PRESIDENT LINCOLN	CONT-NSS	82.4	22.3	170	30,200	24,904	2,494				71,391	1
PRESIDENT MADISON	CONT-NSS	73.2	23.0	178	20,714	17,089	1,484				42,480	1, 3
PRESIDENT MONROE	CONT-NSS	83.1	22.3	170	30,200	24,888	2,494				71,391	1
PRESIDENT PIERCE	CONT-NSS	73.4	23.0	178	20,718	17,092	1,484				42,480	1, 3
PRESIDENT TAFT	CONT-NSS	67.4	23.0	150	17,508	10,572	1,094				31,316	1, 3
PRESIDENT TYLER	CONT-NSS	72.1	22.5	130	38,800	18,805	1,936				55,418	1, 3
PRESIDENT WASHINGTON	CONT-NSS	82.4	22.3	170	30,200	24,888	2,494				71,391	1, 3
PRESIDENT WILSON	CONT-NSS	64.4	20.0	150	19,300	15,911	1,124				32,175	1, 3
RALEIGH BAY	CONT-NSS	84.3	18.2	300	58,626	46,937	4,258				121,386	4
SAN JUAN	CONT-NSS	45.2	17.0	160	17,897	14,765	1,169				33,463	2
SEA-LAND ACHIEVER	CONT-NSS	84.4	18.2	300	58,600	46,937	4,258				121,386	4
SEA-LAND ADVENTURER	CONT-NSS	63.1	19.0	139	15,270	12,550	1,190				34,064	
SEA-LAND ANCHORAGE	CONT-NSS	87.0	20.0		20,953	17,286	1,400				40,075	2
SEA-LAND ATLANTIC	CONT-NSS	85.2	20.0	300	58,620	46,937	4,258				121,836	4
SEA-LAND COMMITMENT	CONT-NSS	85.3	18.2	300	58,600	46,932	4,258				121,886	4
SEA-LAND CONSUMER	CONT-NSS	73.4	23.0	220	26,624	19,040	1,328				38,014	1, 3
SEA-LAND CRUSADER	CONT-NSS	69.1	22.5	100	20,529	17,334	1,326				37,957	1, 3

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	RGE (X00)	DWT(L/T)	DWT(S/T) CARGO	TEU	SQ.FT. (RO-RO)	SQ.FT.	MEAS TONS	MEAS TONS CONT	NOTES
SEA-LAND DEFENDER	CONT-NSS	80.1	22.0	242	29,391	24,635	2,472				70,761	
SEA-LAND DEVELOPER	CONT-NSS	80.2	22.0	242	29,348	24,600	2,472				70,761	
SEA-LAND DISCOVERY	CONT-NSS	68.3	22.5	100	20,400	17,334	1,326				37,957	1, 3
SEA-LAND ECONOMY	CONT-NSS	71.1	23.0	220	25,290	20,864	1,328				38,014	
SEA-LAND ENDURANCE	CONT-NSS	80.4	22.0	242	29,730	24,534	2,472				70,761	
SEA-LAND ENTERPRISE	CONT-NSS	80.4	22.5	180	30,487	22,556	1,708				48,892	1, 3
SEA-LAND EXPEDITION	CONT-NSS	73.1	22.6	180	19,500	15,290	1,356				38,816	1, 3
SEA-LAND EXPLORER	CONT-NSS	80.2	22.0	242	29,342	24,594	2,472				70,761	
SEA-LAND EXPRESS	CONT-NSS	80.3	22.0	242	29,270	24,703	2,472				70,761	
SEA-LAND FREEDOM	CONT-NSS	80.4	22.0	242	29,295	24,555	2,472				70,761	
SEA-LAND HAWAII	CONT-NSS	73.2	22.6	180	19,500	15,290	1,356				38,816	1, 3
SEA-LAND INDEPENDENCE	CONT-NSS	80.3	22.0	242	29,280	24,577	2,472				70,761	
SEA-LAND INNOVATOR	CONT-NSS	80.4	22.0	242	29,392	24,636	2,472				70,761	
SEA-LAND INTEGRITY	CONT-NSS	84.4	20.0	300	59,811	48,447	4,258				121,886	4
SEA-LAND KODIAK	CONT-NSS	87.0	20.0		20,953	17,286	1,400				40,075	2
SEA-LAND LEADER	CONT-NSS	62.0	19.0	139	15,174	12,443	1,190				34,064	
SEA-LAND LEGION	CONT-NSS	68.3	23.0	100	21,012	17,334	1,290				36,926	1, 3
SEA-LAND LIBERATOR	CONT-NSS	80.1	22.0	242	29,295	24,555	2,472				70,761	
SEA-LAND MARINER	CONT-NSS	80.4	22.0	242	29,392	24,670	2,472				70,761	
SEA-LAND NAVIGATOR	CONT-NSS	72.3	22.6	180	31,000	21,829	1,712				49,006	1, 3
SEA-LAND PACER	CONT-NSS	62.4	19.0	189	15,212	12,550	1,190				34,064	
SEA-LAND PACIFIC	CONT-NSS	79.4	22.5	180	30,415	25,575	1,708				48,892	1, 3
SEA-LAND PATRIOT	CONT-NSS	80.0	22.0	242	29,280	24,542	2,472				70,761	
SEA-LAND PERFORMANCE	CONT-NSS	85.4	20.0	300	59,811	46,932	4,258				121,886	4
SEA-LAND PIONEER	CONT-NSS	63.2	19.0	189	15,289	10,955	1,190				34,064	
SEA-LAND PRODUCER	CONT-NSS	74.2	23.0	220	26,624	19,040	1,328				38,014	1, 3
SEA-LAND QUALITY	CONT-NSS	85.2	20.0	300	58,620	46,938	4,258				121,886	4
SEA-LAND TACOMA	CONT-NSS	87.0	20.0		20,953	17,286	1,400				40,075	2
SEA-LAND TRADER	CONT-NSS	73.4	22.6	180	31,000	26,426	1,712				49,006	1, 3
SEA-LAND VALUE	CONT-NSS	84.3	18.2	300	58,626	46,938	4,258				121,886	4
SEA-LAND VENTURE	CONT-NSS	70.4	23.0	200	25,522	21,060	1,328				38,014	
SEA-LAND VOYAGER	CONT-NSS	80.3	22.0	242	29,900	24,677	2,472				70,761	
SHELDON LYKES	CONT-NSS	69.2	19.0	193	15,772	12,505	1,104				31,602	1, 3
AMBASSADOR	RO-RO	80.3	17.0	100	8,995	7,421		86,000				1, 3
AMERICAN CONDOR	RO-RO	81.1	19.7	193	20,730	17,102		198,000				
AMERICAN FALCON	RO-RO	81.0	19.0	260	20,395	16,826		198,000				
ATLANTIC SPIRIT	RO-RO	76.2	25.0	60	16,144	13,319		174,000				2
BAYAMON	RO-RO	70.4	25.0	60	14,180	11,699		168,000				
CAGUAS	RO-RO	74.2	25.0	60	16,079	13,265		174,000				
CYGNUS	RO-RO	77.3	19.2	312	14,935	12,321		121,000				
DOCK EXPRESS TEXAS	RO-RO	76.4	12.0	120	2,804	2,313		21,000				2
FORTALEZA	RO-RO	72.4	25.0	60	13,969	11,524		175,000				2
GREAT LAND	RO-RO	75.3	25.0	60	16,138	13,314		174,000				2
LYRA	RO-RO	77.3	19.5	267	14,591	12,038		121,000				
PONCE	RO-RO	68.1	25.0	60	18,429	15,204		174,000				2
PUERTO RICO	RO-RO	75.1	25.0	60	14,090	11,624		168,000				2
SENATOR	RO-RO	81.3	17.0	154	8,938	7,374		86,000				
WESTWARD VENTURE	RO-RO	77.2	25.0	60	17,915	14,780		174,000				2

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	RGE (X00)	DWT(L/T)	LWT(S/T) CARGO	TEU	SQ.FT. (RO-RO)	SQ.FT.	MEAS TONS	MEAS TONS CONT	NOTES
MILITARY SEALIFT COMMAND CHARTERED:												
AUSTRAL RAINBOW	BARGE TRAN	72.2	22.5	130	29,749	24,543				34,300		1, 3
GREEN HARBOUR	BARGE TRAN	74.4	22.0	150	46,100	38,075				43,610		1, 3
GREEN ISLAND	BARGE TRAN	75.1	22.0	150	46,100	38,075				43,610		1, 3
GREEN VALLEY	BARGE TRAN	74.2	22.0	150	46,100	38,075				43,610		1, 3
DAWN	BREAKBULK	63.2	20.0	176	12,728	10,501			11,347	16,050		1, 3
ELIZABETH LYKES	BREAKBULK	66.0	20.0	195	14,662	12,096			12,022	18,725		1, 3
GREEN WAVE	BREAKBULK	80.0	18.0	118	12,923	10,661			10,000	16,900		
LETITIA LYKES	BREAKBULK	68.1	20.0	120	14,700	12,096			12,022	18,725		1, 3
RAINBOW HOPE	BREAKBULK	80.0	14.0	60	2,220	1,650			3,000	3,250		1, 3
ROVER	CONT RO-RO	69.2	23.6	120	15,694	12,948	758	34,000			21,679	1, 3
AMERICAN TROJAN	CONT-BB	69.1	23.0	120	13,074	10,786	805		15,000	19,125	23,023	1, 3
SANTA ADELA	CONT-BB	66.2	21.0		14,000	11,298	166		12,000	17,125	4,752	1, 3
SANTA JUANA	CONT-BP	66.2	20.8	100	13,695	11,298	166		12,000	17,125	4,748	1, 3
AMERICAN CORMORANT	FLO-FLO	82.0	16.0	271	51,272	42,299			53,000			
AMERICAN EAGLE	RO-RO	81.1	19.0		20,700	16,833		198,000				
MERCURY	RO-RO	77.2	23.0	100	19,200	15,817		151,000				1, 3
MILITARY SEALIFT COMMAND - REDUCED OPERATING STATUS:												
CURTISS	T-AVB	69.2	23.6	95	13,651	11,262	684	168,000			19,580	1
WRIGHT	T-AVB	70.1	23.6	95	13,651	11,262	684	168,000			19,580	1
FSS:												
ALCOL	FSS	73.0	33.0	110	26,075	21,512	44	217,380			1,260	
ALTAIR	FSS	73.0	33.0	110	25,595	21,116	46	211,810			1,317	
ANTARES	FSS	72.0	33.0	110	24,212	19,975	46	211,810			1,317	
BELLATRIX	FSS	73.0	33.0	110	25,915	21,380	44	217,380			1,260	
CAPELLA	FSS	72.0	33.0	109	25,407	20,961	46	211,810			1,317	
DENEBOLA	FSS	73.0	33.0	109	25,169	20,764	46	211,810			1,317	
POLLUX	FSS	73.0	33.0	110	24,212	19,975	46	211,810			1,317	
REGULUS	FSS	73.0	33.0	110	25,595	21,116	44	217,380			1,260	
MPS:												
1ST LT ALEX BONNYMAN	RO-RO/MPS	80.0	17.2	108	23,138	19,089	361	121,600			10,334	
1ST LT BALDO LOPEZ	RO-RO/MPS	85.0	18.0	128	26,502	21,864	578	152,200			16,545	
1ST LT JACK LUMMUS	RO-RO/MPS	86.0	18.0	128	26,502	21,864	578	152,200			16,545	
2ND LT JOHN P BOBO	RO-RO/MPS	85.0	18.0	128	26,523	21,881	578	152,200			16,545	
CPL LOUIS J HAUGE JR	RO-RO/MPS	79.0	17.2	108	23,138	19,089	361	121,600			10,334	
MAJ STEPHEN W PLESS	RO-RO/MPS	83.0	20.0	100	25,008	20,632	532	152,200			15,229	
PFC DEWAYNE WILLIAMS	RO-RO/MPS	85.0	18.0	128	26,523	21,881	578	152,200			16,545	

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	RCE (X00)	DWT(L/T)	DWT(S/T) CARGO	TEU	SQ.FT. (RO-RO)	SQ.FT.	MEAS TONS	MEAS TONS CONT	NOTES
PFC EUGENE A OBREGON	RO-RO/MPS	83.0	20.0	100	25,073	20,685	532	152,200			15,229	
PFC JAMES ANDERSON	RO-RO/MPS	79.0	17.2	108	23,138	19,089	361	121,600			10,334	
PFC WILLIAM B BAUGH	RO-RO/MPS	79.0	17.2	108	23,138	19,089	361	121,600			10,334	
PVT HARRY FISHER	RO-RO/MPS	80.0	17.2	108	23,138	19,089	361	121,600			10,334	
SGT MATEJ KOCAK	RO-RO/MPS	83.0	20.0	100	24,073	19,860	532	152,200			15,229	
SGT WILLIAM R BUTTON	RO-RO/MPS	86.0	18.0	128	26,502	21,864	578	152,200			16,545	

NOTES:

1: VESSEL ELIGIBLE FOR OPERATING DIFFERENTIAL SUBSIDY (ODS).

2: VESSEL ELIGIBLE TO TRADE IN THE JONES ACT TRADE.

3: VESSEL CONSTRUCTED WITH CONSTRUCTION DIFFERENTIAL SUBSIDY (CDS).

4: VESSEL CONSTRUCTED UNDER SECTION 615 WAVIER.

JULY 1988 U.S. FLAG TANKER FLEET

COMMERCIAL FLEET:

VESSEL NAME	SHIP TYPE	MILUSE YES OR NO	YEAR BUILT	SPEED	PCE (X00)	DWT(L/T)	CAPACITY BBLS	NOTES
ALASKAN	CHEMICAL	Y	44.3	14.0	70	24,400	170,000	2
CHEMICAL PIONEER	CHEMICAL	Y	68.2	15.0	80	34,400	215,500	2
CHILBAR	CHEMICAL	Y	59.1	17.0	109	33,700	298,000	2
EDGAR M QUEENY	CHEMICAL	Y	70.3	16.0	80	37,100	298,000	2
MARINE CHEMIST	CHEMICAL	Y	70.4	16.0	100	35,900	285,000	2
OMI DYNACHEM	CHEMICAL	Y	81.3	15.0	230	49,500	360,000	2
SEA VENTURE	CHEMICAL	Y	72.2	16.0	200	10,000	138,000	2
ADONIS	CRUDE	Y	66.3	16.0	240	80,200	607,000	2
ARCO ALASKA	CRUDE	N	79.4	15.0	130	138,400	1,300,000	2
ARCO CALIFORNIA	CRUDE	N	80.3	15.0	130	188,700	1,300,000	2
ARCO TEXAS	CRUDE	Y	73.2	15.0	80	90,000	516,000	2
ATIGUN PASS	CRUDE	N	77.4	16.0		173,400	1,200,000	2
B T ALASKA	CRUDE	N	78.1	15.0		188,100	1,300,000	2
B T SAN DIEGO	CRUDE	N	78.4	15.0		188,100	1,300,000	2
BROOKS RANGE	CRUDE	N	78.2	16.0	160	173,400	1,200,000	2
CHEVRON LOUISIANA	CRUDE	Y	77.3	15.0	99	39,500	270,000	2
CHEVRON OREGON	CRUDE	Y	75.4	15.0	99	39,200	270,000	2
EXXON BAYTOWN	CRUDE	Y	84.3	16.0	103	57,700	450,000	2
EXXON BENICIA	CRUDE	N	79.2	15.0	150	172,800	1,190,000	2
EXXON NORTH SLOPE	CRUDE	N	79.1	16.0	150	173,400	1,200,000	2
KENAI	CRUDE	N	79.1	17.0	140	123,100	840,000	2
KEYSTONE CANYON	CRUDE	N	78.1	16.0		173,400	1,200,000	2
MOBIL ARCTIC	CRUDE	N	72.3	16.0	170	129,000	937,000	2
MOBILE BAY	CRUDE	Y	54.4	16.0	150	30,300	246,000	2
OCEAN CHALLENGER	CRUDE	N	76.2	14.0	200	264,100	2,056,000	1, 3
OCEAN RUNNER	CRUDE	N	75.4	14.0	200	264,100	2,056,000	1, 3
OCEAN WIZARD	CRUDE	N	76.3	14.0	200	264,100	2,056,000	1, 3
OMI COLUMBIA	CRUDE	N	74.0	16.0	250	136,200	1,048,000	2
OVERSEAS BOSTON	CRUDE	N	74.1	16.0	150	121,700	929,000	2
PRINCE WILLIAM SOUND	CRUDE	N	75.4	17.0		124,000	990,000	2
TEXAS SUN	CRUDE	Y	60.4	17.0		53,500	405,000	2
THOMPSON PASS	CRUDE	N	78.3	16.0	160	173,400	1,200,000	2
TONSINA	CRUDE	N	78.2	17.0	140	122,900	840,000	2
BALTIMORE/BALTIMORE	LIQUID ITB	Y	83.2	15.0		48,000	350,000	2
CAROLE G INGRAM/IOS 3302	LIQUID ITB	Y	72.1	14.0		36,600	130,000	2
ENERGY ALTAIR/ENERGY AMMO	LIQUID ITB	Y	82.4	12.0		16,000	125,000	2
ESTHER MORAN/TEXAS	LIQUID ITB	Y	63.4	12.0		18,000	125,000	2
FRANCES HAMMER/OXY4103	LIQUID ITB	Y	81.3	15.0		41,000	300,000	1, 3
GROTON/GROTON	LIQUID ITB	Y	82.2	10.0		48,000	350,000	2
JACKSONVILLE/JACKSONVILLE	LIQUID ITB	Y	82.1	15.0		48,000	350,000	2
JULIUS HAMMER/OXY 4101	LIQUID ITB	Y	81.1	15.0		41,000	300,000	1, 3
MARTHA R INGRAM/IOS 3301	LIQUID ITB	Y	71.3	14.0		36,600	270,000	2
MOBILE/MOBILE	LIQUID ITB	Y	84.2	15.0		47,600	350,000	2
NEW YORK/NEW YORK	LIQUID ITB	Y	83.1	15.0		48,000	350,000	2
PHILADELPHIA/PHILADELPHIA	LIQUID ITB	Y	83.2	15.0		47,600	350,000	2
SEABULK CHALLENGER/STL390	LIQUID ITB	Y	75.1	15.0		21,000	320,000	2
SEABULK MAGNACHEM/SCC3902	LIQUID ITB	Y	77.1	15.0		18,700	320,000	2

VESSEL NAME	SHIP TYPE	MILUSE YES OR NO	YEAR BUILT	SPEED	RCE (X00)	DWT(L/T)	CAPACITY BBLS	NOTES
ARZEW	LNG	N	78.4	18.0	140	74,000	786,000	1, 3
GAMMA	LNG	N	79.2	19.0	140	74,000	786,000	1, 3
LNG AQUARIUS	LNG	N	77.2	20.0	100	71,500	771,000	1, 3
LNG ARIES	LNG	N	77.4	20.0	100	71,400	771,000	1
LNG CAPRICORN	LNG	N	78.2	20.0	100	71,400	771,000	1
LNG GEMINI	LNG	N	78.3	20.0	100	71,400	771,000	2
LNG LEO	LNG	N	78.4	20.0	100	71,400	771,000	2
LNG LIBRA	LNG	N	79.2	20.0	100	71,500	771,000	2
LNG TAURUS	LNG	N	79.3	20.0	100	71,500	771,000	2
LNG VIRGO	LNG	N	79.4	20.0	100	71,500	771,000	2
SOUTHERN	LNG	N	78.2	19.0	140	74,000	786,000	1, 3
CORNUCOPIA	LPG	N	58.4	16.0	140	22,700	150,000	2
ADMIRALTY BAY	PRODUCT	Y	71.2	17.0	100	80,600	611,000	2
AMERICA SUN	PRODUCT	Y	69.4	18.0		80,700	595,000	2
AMERICAN HERITAGE	PRODUCT	Y	76.4	16.0	220	91,800	663,000	1
ARCO ANCHORAGE	PRODUCT	N	73.2	16.0	170	120,600	924,000	2
ARCO FAIRBANKS	PRODUCT	N	74.3	16.0	170	120,600	924,000	2
ARCO INDEPENDENCE	PRODUCT	N	77.4	15.0	200	262,400	2,056,000	1
ARCO JUNEAU	PRODUCT	N	74.2	16.0	170	120,600	924,000	2
ARCO PRUDHOE BAY	PRODUCT	Y	71.4	15.0	80	70,400	550,000	2
ARCO SAC RIVER	PRODUCT	Y	72.2	16.0	80	70,400	550,000	2
ARCO SPIRIT	PRODUCT	N	77.2	15.0	200	262,400	2,056,000	1
ASPEN	PRODUCT	Y	71.3	17.0	99	80,600	611,000	2
BALTIMORE TRADER	PRODUCT	Y	55.2	15.0	190	57,900	490,000	2
BAY RIDGE	PRODUCT	N	79.2	17.0	190	225,000	1,655,000	1
BEAVER STATE	PRODUCT	Y	76.2	17.0	220	91,800	663,000	1
BLUE RIDGE	PRODUCT	Y	81.2	15.0	99	42,300	300,000	2
BROOKLYN	PRODUCT	N	73.4	17.0	170	226,100	1,655,000	1
CHABLIS	PRODUCT	Y	60.4	17.0	134	29,200	250,000	2
CHARLESTON	PRODUCT	Y	56.4	16.0	155	39,400	154,000	2
CHELSEA	PRODUCT	Y	75.1	16.0	170	39,700	270,000	1
CHERRY VALLEY	PRODUCT	Y	74.3	16.0		39,700	270,000	1
CHESAPEAKE TRADER	PRODUCT	Y	82.4	14.0	240	50,100	356,000	2
CHESTNUT HILL	PRODUCT	Y	76.4	16.0	60	91,300	663,000	1
CHEVRON ARIZONA	PRODUCT	Y	77.4	15.0	99	39,200	270,000	2
CHEVRON CALIFORNIA	PRODUCT	Y	72.3	15.0	78	70,200	548,000	2
CHEVRON COLORADO	PRODUCT	Y	76.4	15.0	99	39,200	270,000	2
CHEVRON MISSISSIPPI	PRODUCT	Y	72.4	15.0	78	70,200	548,000	2
CHEVRON WASHINGTON	PRODUCT	Y	76.2	15.0	99	39,600	270,000	2
COAST RANGE	PRODUCT	Y	81.2	15.0	114	40,000	300,000	2
COASTAL MANATEE	PRODUCT	Y	61.4	17.0	127	30,800	250,000	2
COLORADO	PRODUCT	Y	44.1	14.0	121	30,400	253,000	2
CONCHO	PRODUCT	Y	45.2	14.0	198	32,700	280,000	2
COPPER MOUNTAIN	PRODUCT	Y	64.3	16.0	205	71,800	535,000	2
CORONADO	PRODUCT	Y	73.4	16.0	200	39,700	270,000	1
COVE LEADER	PRODUCT	Y	59.4	17.0	348	67,400	469,000	2
COVE LIBERTY	PRODUCT	Y	54.2	16.0	238	69,300	506,000	2
COVE TRADER	PRODUCT	Y	59.3	16.0	200	46,400	395,000	2
DELAWARE TRADER	PRODUCT	Y	82.4	14.0		50,100	356,000	2
EXXON BALTIMORE	PRODUCT	Y	60.3	17.0	205	51,100	409,000	2
EXXON BATON ROUGE	PRODUCT	Y	70.1	16.0	103	75,600	637,000	2
EXXON BOSTON	PRODUCT	Y	60.4	17.0	186	52,000	409,000	2
EXXON CHARLESTON	PRODUCT	Y	33.4	16.0	105	40,200	370,000	2

VESSEL NAME	SHIP TYPE	MILUSE YES OR NO	YEAR BUILT	SPEED	RGE (X00)	DWT(L/T)	CAPACITY BBLS	NOTES
EXXON GALVESTON	PRODUCT	Y	70.3	12.0	87	27,300	194,000	2
EXXON HOUSTON	PRODUCT	Y	64.2	16.0	103	67,900	576,000	2
EXXON JAMESTOWN	PRODUCT	Y	57.2	18.0	121	39,000	312,000	2
EXXON LEXINGTON	PRODUCT	Y	58.2	18.0	118	39,100	240,000	2
EXXON LONG BEACH	PRODUCT	N	87.1	16.0		211,469	1,485,000	2
EXXON NEW ORLEANS	PRODUCT	Y	65.2	16.0	103	67,800	571,000	2
EXXON PHILADELPHIA	PRODUCT	Y	70.2	16.0	103	75,600	637,000	2
EXXON PRINCETON	PRODUCT	Y	82.2	16.0	198	43,000	301,000	2
EXXON SAN FRANCISCO	PRODUCT	Y	69.4	16.0	103	75,600	637,000	2
EXXON VALDEZ	PRODUCT	N	86.4	16.0		211,469	1,485,000	2
EXXON WASHINGTON	PRODUCT	Y	57.2	18.0	122	40,900	321,000	2
EXXON WILMINGTON	PRODUCT	Y	84.3	16.0	105	48,000	370,000	2
EXXON YORKTOWN	PRODUCT	Y	83.2	15.0	195	43,000	308,000	2
FALCON COUNTESS	PRODUCT	Y	71.2	16.0	179	37,300	303,000	2
FALCON DUCHESS	PRODUCT	Y	71.2	16.0	138	37,300	303,000	2
FALCON PRINCESS	PRODUCT	Y	72.2	16.0	179	37,300	303,000	2
FREDERICKSBURG	PRODUCT	Y	58.2	18.0	72	39,000	311,000	2
GLACIER BAY	PRODUCT	Y	70.2	17.0	81	81,000	612,000	2
GOLDEN ENDEAVOR	PRODUCT	Y	74.4	16.0	223	91,800	562,000	1
GOLDEN GATE	PRODUCT	Y	70.2	15.0	181	62,100	513,000	2
GOLDEN MONARCH	PRODUCT	Y	75.2	16.0	220	91,400	663,000	1
GUADALUPE	PRODUCT	Y	45.2	14.0	125	30,400	223,000	2
KEYSTONER	PRODUCT	Y	53.4	15.0	60	18,400	149,000	2
KING	PRODUCT	Y	57.2	17.0	161	34,700	275,000	2
KITTANNING	PRODUCT	Y	77.1	16.0	220	91,300	663,000	1
KNIGHT	PRODUCT	Y	58.2	17.0	161	34,700	275,000	2
LION OF CALIFORNIA	PRODUCT	Y	54.3	14.0	168	16,200	131,000	2
MOBIL MERIDIAN	PRODUCT	Y	61.3	17.0	160	49,200	387,000	2
MONTRACHET	PRODUCT	Y	59.3	17.0	120	30,800	250,000	2
NORMACSKY	PRODUCT	Y	77.1	16.0	140	39,200	286,000	1
NORMACSTAR	PRODUCT	Y	75.4	16.0	140	39,200	286,000	1
NORMACSUN	PRODUCT	Y	76.2	16.0	140	39,200	286,000	1
NECHES	PRODUCT	Y	58.4	17.0	140	34,900	281,000	2
NEW YORK SUN	PRODUCT	Y	80.4	15.0	120	30,900	251,000	2
OMI CHAMPION	PRODUCT	Y	69.4	16.0	130	37,900	334,000	2
OMI CHARGER	PRODUCT	Y	69.4	16.0	130	37,800	328,000	2
OMI HUDSON	PRODUCT	Y	81.4	15.0	230	49,500	360,000	2
OMI LEADER	PRODUCT	Y	69.2	17.0	120	37,800	328,000	2
OMI WABASH	PRODUCT	Y	69.2	16.0	120	37,900	297,000	2
OMI WILLAMETTE	PRODUCT	Y	69.1	16.0	120	37,900	297,000	2
OVERSEAS ALASKA	PRODUCT	Y	70.4	16.0	160	62,000	395,000	2
OVERSEAS ARCTIC	PRODUCT	Y	71.2	16.0	160	62,000	395,000	2
OVERSEAS CHICAGO	PRODUCT	Y	77.2	16.0	220	90,600	663,000	2
OVERSEAS JUNEAU	PRODUCT	N	73.4	16.0	230	120,500	940,000	2
OVERSEAS NATALIE	PRODUCT	Y	61.4	16.0	220	69,000	598,000	2
OVERSEAS NEW YORK	PRODUCT	Y	77.4	16.0	220	90,400	663,000	2
OVERSEAS OHIO	PRODUCT	Y	77.4	16.0	220	90,600	663,000	2
OVERSEAS WASHINGTON	PRODUCT	Y	78.1	16.0	220	90,500	663,000	2
PECOS	PRODUCT	Y	50.1	16.0	150	28,700	233,000	2
PENNSYLVANIA TRADER	PRODUCT	Y	62.4	15.0	150	34,100	269,000	2
PHILADELPHIA SUN	PRODUCT	Y	81.3	15.0	120	34,100	241,000	2
POMEROL	PRODUCT	Y	58.3	15.0	150	30,300	246,000	2
POTOMAC TRADER	PRODUCT	Y	83.2	14.0	150	50,100	356,000	2

VESSEL NAME	SHIP TYPE	MILUSE YES OR NO	YEAR BUILT	SPEED	RCE (X00)	DWT(L/T)	CAPACITY BBLS	NOTES
SABINE	PRODUCT	Y	57.3	15.0	30	34,900	275,000	2
SANSINENA II	PRODUCT	Y	71.3	16.0	140	70,500	549,000	2
SIERRA MADRE	PRODUCT	Y	81.4	16.0	90	40,000	300,000	2
SOLAR	PRODUCT	Y	59.4	17.0	120	29,200	250,000	2
SPRAY	PRODUCT	Y	60.3	17.0	120	29,200	250,000	2
ST EMILION	PRODUCT	Y	56.3	16.0	140	32,800	268,000	2
STUYVESANT	PRODUCT	N	77.3	17.0	190	224,700	1,665,000	1
SYOSSET	PRODUCT	Y	58.2	15.0	150	30,300	246,000	2
TEXACO CALIFORNIA	PRODUCT	Y	54.1	19.0	140	42,000	359,000	2
TEXACO CONNECTICUT	PRODUCT	Y	53.4	19.0	140	42,000	359,000	2
TEXACO FLORIDA	PRODUCT	Y	56.3	19.0	140	42,000	359,000	2
TEXACO GEORGIA	PRODUCT	Y	64.1	17.0	170	25,200	208,000	2
TEXACO MASSACHUSETTS	PRODUCT	N	63.1	17.5	170	208,000	208,000	2
TEXACO MINNESOTA	PRODUCT	Y	43.2	13.0	130	26,700	218,000	2
TEXACO MISSISSIPPI	PRODUCT	Y	44.1	13.0	120	26,600	218,000	2
TEXACO MONTANA	PRODUCT	Y	65.2	17.0	120	26,600	212,000	2
TEXACO NEW YORK	PRODUCT	Y	53.3	15.0	140	42,000	359,000	2
TEXACO RHODE ISLAND	PRODUCT	Y	64.3	17.0	110	25,400	208,000	2
TROPIC SUN	PRODUCT	Y	57.4	17.0	140	34,700	275,000	2
U S T ATLANTIC	PRODUCT	N	79.1	15.0	260	396,700	3,000,000	1, 3
U S T PACIFIC	PRODUCT	N	79.4	16.0	260	398,100	3,000,000	1, 3
VALLEY FORGE	PRODUCT	Y	66.4	16.0	70	37,900	329,000	2
WILLIAMSBURGH	PRODUCT	N	74.4	17.0	170	225,100	1,655,000	1, 3
LOUISIANA BRIMSTONE	SULPHUR	N	43.0	14.0	50	24,200	89,000	2
MARINE DUVAL	SULPHUR	N	44.2	14.0	180	24,700		2
MARINE FLORIDIAN	SULPHUR	N	44.4	14.0	180	24,800		2
MSC CHARTERED TANKERS:								
BRAVADO	COASTAL	Y	77.3	12.0		4,300	28,000	
COURIER	PRODUCT	Y	77.1	16.0	120	35,100	308,000	1, 3
FALCON CHAMPION	PRODUCT	Y	84.1	16.0	270	33,900	224,000	1, 3
FALCON LEADER	PRODUCT	Y	83.3	16.0	270	33,500	224,000	1, 3
GUS W DARNELL	PRODUCT	Y	85.3	16.0	120	30,000	238,000	2
LAWRENCE H. GIANELLA	PRODUCT	Y	86.2	16.0	120	30,000	239,500	2
OVERSEAS ALICE	PRODUCT	Y	68.2	17.0	130	37,800	336,000	2
OVERSEAS VALDEZ	PRODUCT	Y	68.4	17.0	120	37,800	336,000	2
OVERSEAS VIVIAN	PRODUCT	Y	69.1	17.0	120	37,800	336,000	2
PATRIOT	PRODUCT	Y	76.2	16.0	120	35,100	308,000	1, 3
PAUL BUCK	PRODUCT	Y	85.2	16.0	120	30,000	238,000	2
RANGER	PRODUCT	Y	76.3	16.0	120	35,100	308,000	1, 3
RICHARD G MATTHIESEN	PRODUCT	Y	86.2	16.0	120	30,000	239,500	2
ROVER	PRODUCT	Y	77.1	16.0	120	35,100	308,000	1, 3
SAMUEL L COBB	PRODUCT	Y	85.4	16.0	100	30,000	238,000	2
SEALIFT ANTARCTIC	PRODUCT	Y	75.3	16.0	160	27,200	225,000	2
SEALIFT ARABIAN SEA	PRODUCT	Y	75.1	16.0	120	27,300	225,000	2
SEALIFT ARCTIC	PRODUCT	Y	75.2	16.0	120	27,200	225,000	2
SEALIFT ATLANTIC	PRODUCT	Y	74.3	16.0	120	27,200	225,000	2
SEALIFT CARIBBEAN SEA	PRODUCT	Y	75.1	16.0	120	27,200	225,000	2
SEALIFT CHINA SEA	PRODUCT	Y	75.2	16.0	120	27,300	225,000	2
SEALIFT INDIAN OCEAN	PRODUCT	Y	75.3	16.0	120	27,300	225,000	2
SEALIFT MEDITERRANEAN	PRODUCT	Y	74.4	16.0	120	27,200	225,000	2
SEALIFT PACIFIC	PRODUCT	Y	74.3	16.0	120	27,300	225,000	2

NOTES:

1: VESSEL ELIGIBLE FOR OPERATING DIFFERENTIAL SUBSIDY (ODS).

2: VESSEL ELIGIBLE TO TRADE IN THE JONES ACT TRADE.

3: VESSEL CONSTRUCTED WITH CONSTRUCTIION DIFFERENTIAL SUBSIDY (CDS).

4: VESSEL CONSTRUCTED WITH SECTION 615 WAVIER.

JULY 1988 U.S. FLAG BULK AND PASSENGER FLEET

NAME	TYPE	BUILT	SPEED	DWT
ALTAIR *	BULK	86.3	15.5	63,139
ARCHON	BULK	84.2	15.0	63,700
ARION *	BULK	86.3	15.5	63,139
ASPEN *	BULK	86.3	15.5	63,139
AURORA	BULK	84.1	15.0	63,139
BETTY WOOD	BULK ITB	73.1	16.0	23,700
CALRICE TRANSPORT	BULK	76.1	16.0	25,400
ENERGY INDEPENDENCE	COLLIER	83.1	15.0	32,846
EROL BEKER	BULK ITB	82.1	10.0	21,500
GOLDEN PHOENIX	BULK OIL	83.2	13.5	128,000
INGER	BULK	45.1	14.5	23,510
JADE PHOENIX	BULK OIL	82.1	13.5	128,000
JAMIE A BAXTER	BULK ITB	77.1	12.5	24,400
MARINE PRINCESS	BULK	67.3	15.5	52,565
MOKU PAHU	BULK ITB	82.1	16.0	25,900
OMI MISSOURI	BULK	83.1	15.0	45,500
OMI SACRAMENTO	BULK	83.4	15.0	48,890
OVERSEAS HARRIETTE	BULK	78.1	15.0	25,541
OVERSEAS MARILYN	BULK	78.1	15.0	25,541
PRIDE OF TEXAS	BULK	81.1	15.0	34,500
SEADRIFT	BULK OIL	42.1	10.9	16,576
SPIRIT OF TEXAS	BULK	81.1	15.0	36,476
STAR OF TEXAS	BULK	82.1	15.0	36,476
SUGAR ISLANDER	BULK	73.1	15.0	29,648
ULTRASEA	OBO	73.1	16.5	82,200
ULTRAMAR	OBO	74.1	16.5	82,200
CONSTITUTION	PASSENGER	52.1	25.0	7,108
INDEPENDENCE	PASSENGER	51.1	25.0	7,136
MONTEREY	PASSENGER	51.1	20.0	6,454
UNITED STATES	PASSENGER	52.1	33.0	12,810

* VESSELS HAVE CELL GUIDES ENABLING THEM TO CARRY CONTAINERS IF DESIRED.

JULY 1988 READY RESERVE FORCE (RRF)

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	RGE (X00)	DWT(L/T)	CARGO DWT(S/T)	TEU	SQ.FT. (RO-RO)	SQ.FT.	MEAS TONS	MEAS TONS CONT	TANKER BBLS
AUSTRAL LIGHTNING	BARGE TRAN	71.2	22.5	130	29,820	24,602				34,300		
CAPE FAREWELL	BARGE TRAN	73.2	22.0	150	40,400	33,330	72			43,610	2,061	
CAPE FLATTERY	BARGE TRAN	73.3	22.0	150	40,572	33,472	72			43,610	2,061	
CAPE FLORIDA	BARGE TRAN	71.1	22.5	130	29,820	24,602				30,380		
CAPE MAY	BARGE TRAN	72.3	20.0	160	38,410	31,688				37,183		
CAPE MENDOCINO	BARGE TRAN	72.2	22.0	160	38,410	31,688				37,183		
CAPE MOHICAN	BARGE TRAN	73.1	20.0	160	38,410	31,688				37,183		
ADVENTURER	BREAKBULK	60.4	18.5	130	10,986	9,063			10,000	14,375		
AGENT	BREAKBULK	61.1	18.5	130	11,087	9,148			10,000	14,375		
AIDE	BREAKBULK	61.2	18.5	130	11,021	9,092			10,000	14,375		
AMBASSADOR	BREAKBULK	60.3	18.5	130	10,986	9,063			10,000	14,375		
BANNER	BREAKBULK	61.4	18.5	260	12,629	10,419			10,000	17,675		
BUYER	BREAKBULK	62.2	18.5	121	12,529	10,336			10,000	16,575		
CALIFORNIA	BREAKBULK	62.1	20.0	253	14,349	11,838			12,000	17,467		
CAPE ALAVA	BREAKBULK	62.3	20.0	173	12,728	10,501			12,500	16,050		
CAPE ALEXANDER	BREAKBULK	62.4	20.0	173	12,728	10,501			12,500	16,050		
CAPE ANN	BREAKBULK	62.4	20.0	173	12,728	10,501			12,500	16,050		
CAPE ARCHWAY	BREAKBULK	63.1	20.0	173	12,728	10,501			12,500	16,050		
CAPE AVINOF	BREAKBULK	63.2	20.0	173	12,728	10,501			12,500	16,050		
CAPE BLANCO	BREAKBULK	66.3	20.0	195	14,662	12,096			12,022	18,725		
CAPE BON	BREAKBULK	67.3	20.0	195	14,662	12,096			12,022	18,725		
CAPE BORDA	BREAKBULK	67.2	20.0	195	14,662	12,096			12,022	18,725		
CAPE BOVER	BREAKBULK	67.1	20.0	195	14,662	12,096			12,022	18,725		
CAPE BRETON	BREAKBULK	67.2	20.0	195	14,662	12,096			12,022	18,725		
CAPE CANAVERAL	BREAKBULK	64.1	18.0	184	12,684	10,464			9,901	13,825		
CAPE CANSO	BREAKBULK	63.3	18.0	184	12,684	10,464			9,901	13,825		
CAPE CARTHAGE	BREAKBULK	63.4	18.0	184	12,622	10,464			9,901	13,825		
CAPE CATAWBA	BREAKBULK	60.4	18.0	140	12,466	10,284			9,000	13,075		
CAPE CATOCHE	BREAKBULK	63.4	18.0	184	12,684	10,464			9,901	13,825		
CAPE CHALMERS	BREAKBULK	63.2	18.0	184	11,293	9,317			9,901	13,700		
CAPE CHARLES	BREAKBULK	63.3	18.0	184	12,684	10,464			9,901	13,825		
CAPE CLEAR	BREAKBULK	63.4	18.0	184	12,684	10,464			9,901	13,825		
CAPE COD	BREAKBULK	63.1	18.0	184	12,684	10,464			9,901	13,700		
CAPE GIBSON	BREAKBULK	68.4	20.8	140	22,216	18,328			17,000	25,450		
CAPE GIRARDEAU	BREAKBULK	68.4	20.8	140	22,208	18,322			17,000	25,450		
CAPE JOHNSON	BREAKBULK	62.4	20.0	140	14,467	11,935			12,000	18,700		
COURIER	BREAKBULK	62.4	18.5	90	12,705	10,482			10,000	17,675		
DEL MONTE	BREAKBULK	68.2	18.6	150	13,039	10,757			10,000	16,175		
DEL VALLE	BREAKBULK	68.4	18.5	150	13,039	10,757			10,000	16,175		
DEL VIENTO	BREAKBULK	68.4	18.5	150	13,039	10,757			10,000	16,175		
GULF BANKER	BREAKBULK	64.2	18.0	171	11,367	9,378			9,901	13,775		
GULF FARMER	BREAKBULK	64.2	18.0	171	11,367	9,378			9,901	13,775		
GULF MERCHANT	BREAKBULK	65.1	18.0	171	11,368	9,379			9,901	13,775		
GULF SHIPPER	BREAKBULK	64.4	18.0	171	11,368	9,379			9,901	13,775		
GULF TRADER	BREAKBULK	64.3	18.0	171	11,368	9,379			9,901	13,775		
HATTIESBURG VICTORY	BREAKBULK	45.3	15.8	240	10,755	8,873			6,611	11,330		
LAKE	BREAKBULK	61.2	18.0	140	12,476	10,293			9,000	13,100		
NORTHERN LIGHT	BREAKBULK	61.3	18.0	140	12,537	10,343			9,000	12,000		

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	RCE (X00)	DWT(L/T)	CARGO DWT(S/T)	TEU	SQ.FT. (RO-RO)	SQ.FT.	MEAS TONS	MEAS TONS CONT	TANKER BBLS
PIONEER COMMANDER	BREAKBULK	63.2	21.0	120	13,535	11,166			13,226	16,075		
PIONEER CONTRACTOR	BREAKBULK	63.3	21.0	120	13,535	11,166			13,226	16,075		
PIONEER CRUSADER	BREAKBULK	63.4	21.0	120	13,540	11,171			13,226	15,550		
PRILE	BREAKBULK	60.3	18.0	140	12,402	10,232			9,000	13,100		
SANTA ANA	BREAKBULK	63.1	20.0	140	14,376	11,860			12,000	18,450		
SCAN	BREAKBULK	61.2	18.0	140	12,483	10,298			9,000	13,100		
SOUTHERN CROSS	BREAKBULK	62.2	18.0	140	12,519	10,328			9,000	12,000		
CAPE NOME	CONT RO-RO	69.3	23.6	120	15,694	12,498	758	34,000			21,698	
ADM WM H CALLAGHAN	RO-RO	67.0	25.0	60	13,500	11,138		168,000				
CAPE DECISION	RO-RO	73.3	21.0	194	23,865	19,689		165,000				
CAPE DIAMOND	RO-RO	72.3	22.3	179	23,725	19,573		165,000				
CAPE DOMINGO	RO-RO	73.1	21.0	179	23,725	19,573		165,000				
CAPE DOUGLAS	RO-RO	73.0	21.0	194	22,880	18,876		165,000				
CAPE DUCATO	RO-RO	72.3	22.0	194	23,350	19,264		165,000				
CAPE EDMONT	RO-RO	71.0	19.0	173	20,225	16,686		198,000				
CAPE HENRY	RO-RO	79.2	20.0	174	31,524	26,007		185,000				
CAPE HORN	RO-RO	79.3	21.0	178	31,298	25,821		220,000				
CAPE HUDSON	RO-RO	79.2	21.0	178	31,427	25,927		220,000				
CAPE INSCRIPTION	RO-RO	76.2	23.0	190	19,172	15,817		153,000				
CAPE ISABEL	RO-RO	76.4	23.0	190	20,348	16,787		153,000				
CAPE LAMBERT	RO-RO	73.3	19.0	95	20,220	16,682		134,000				
CAPE LOBOS	RO-RO	72.0	19.0	.95	20,221	16,682		134,000				
COMET	RO-RO	58.1	18.0	120	10,111	8,342		85,406				
JUPITER	RO-RO	76.2	23.0	100	19,172	15,817		151,000				
METEOR	RO-RO	67.2	20.0	100	12,326	10,169		99,270				
MAINE	SEATRAIN	44.0	16.0	120	12,312	10,157		68,000				
WASHINGTON	SEATRAIN	44.2	16.5	120	12,292	10,141		68,000				
KEYSTONE STATE	T-ACS-1	66.2	20.0	160	13,600	11,220	468				13,397	
GEM STATE	T-ACS-2	66.1	20.0	160	13,600	11,220	484				13,855	
GRAND CANYON STATE	T-ACS-3	65.4	20.0	160	13,600	11,220	484				13,855	
GOPHER STATE	T-ACS-4	73.1	20.0	120	16,445	13,649	482				13,797	
FLICKERTAIL STATE	T-ACS-5	69.1	20.0	180	16,343	13,483	482				13,797	
CORNHUSKER STATE	T-ACS-6	69.2	20.0	180	16,343	13,483	482				13,797	
TANKERS:												
ALATNA	PRODUCT	57.3	12.0	100	4,933							50,000
AMERICAN EXPLORER	PRODUCT	59.4	20.0	140	24,226							180,000
AMERICAN OSPREY	PRODUCT	68.1	16.5	161	34,723							275,000
CHATTAHOOCHEE	PRODUCT	57.4	12.0	100	4,933							50,000
MISSION BUENAVENTURA	PRODUCT	68.3	16.0	120	38,200							326,000
MISSION CAPISTRANO	PRODUCT	71.3	16.0	160	37,300							303,000
NODAWAY	PRODUCT	45.3	10.0	60	4,000							50,000
POTOMAC	PRODUCT	57.1	18.0	180	27,467							200,000
SHOSHONE	PRODUCT	57.2	18.0	180	26,943							187,000
PASSENGER:												
PATRIOT STATE	PASSENGER	64.2	20.0	85	8,759	4,380				5,700		

JULY 1988 NATIONAL DEFENSE RESERVE FLEET (NDRF)

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	RGE (X00)	DWT(L/T)	CARGO DWT(S/T)	TEU	SQ.FT (RO-RO)	SQ.FT.	MEAS TONS	MEAS TON CONT	TANKER BBLS	PASSENGERS
BENJAMIN HARRISON	BARGE TRAN	80.3	22.0	150	45,795	37,781				43,610			
EDWARD RUTLEDGE	BARGE TRAN	81.4	22.0	150	45,795	37,781				43,610			
ADELPHI VICTORY	BREAKBULK	45.2	15.8	240	10,681	8,812			6,611	11,330			
ALBION VICTORY	BREAKBULK	45.1	15.8	240	10,584	8,732			6,611	11,330			
ALLEGHENY VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,611	11,330			
AMARILLO VICTORY	BREAKBULK	45.3	15.8	240	10,719	8,843			6,611	11,330			
AMERICAN RACER	BREAKBULK	64.4	21.0	170	13,264	10,943			12,500	13,425			
AMERICAN RANGER	BREAKBULK	65.2	21.0	170	13,264	10,943			12,000	11,508			
AMERICAN RELIANCE	BREAKBULK	65.2	21.0	170	13,264	10,943			12,500	13,425			
AMERICAN VICTORY	BREAKBULK	45.2	15.8	240	10,725	8,848			6,611	11,330			
ANCHORAGE VICTORY	BREAKBULK	41.0	15.8	240	10,681	8,812			6,611	11,330			
ASBURY VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,611	11,330			
BARNARD VICTORY	BREAKBULK	45.2	15.8	240	10,681	8,812			6,611	11,330			
BARRE VICTORY	BREAKBULK	45.3	15.8	240	10,584	8,732			6,611	11,330			
BATTLE CREEK VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,511	11,330			
BAY	BREAKBULK	61.4	18.0	121	12,629	10,419			10,000	16,575			
BEATRICE VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
BELGIUM VICTORY	BREAKBULK	44.2	17.0	200	10,678	8,809			6,463	11,330			
BEREA VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
BERKELEY VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
BESSEMER VICTORY	BREAKBULK	45.3	15.8	240	10,721	8,845			6,611	11,330			
BRAZIL VICTORY	BREAKBULK	44.2	17.0	200	10,697	8,825			6,463	11,330			
BUCKNELL VICTORY	BREAKBULK	45.1	15.8	240	10,858	8,958			6,611	11,330			
BUILDER	BREAKBULK	62.1	18.5	121	12,485	10,300			10,000	16,575			
CANTON VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,611	11,330			
CAPE GASPE	BREAKBULK	65.1	21.0	170	13,264	10,943			12,500	17,175			
CAPE GEORGIA	BREAKBULK	65.3	21.0	170	13,264	10,943			12,500	17,175			
CAPE JOHN	BREAKBULK	62.2	20.0	140	14,361	11,848			12,000	18,450			
CAPE JUBY	BREAKBULK	62.3	20.0	140	14,321	11,815			12,000	18,450			
CAPE JUNCTION	BREAKBULK	62.2	20.0	140	14,389	11,871			12,000	18,450			
CARROLL VICTORY	BREAKBULK	44.3	17.0	200	10,712	8,837			6,463	11,330			
CATAWBA VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,611	11,330			
CCNY VICTORY	BREAKBULK	45.3	15.8	240	10,584	8,732			6,611	11,330			
CENTRAL VICTORY	BREAKBULK	45.2	15.8	240	10,681	8,812			6,611	11,330			
CITADEL VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
CLARKSVILLE VICTORY	BREAKBULK	45.1	15.8	240	10,900	8,993			6,611	11,330			
COMMERCE	BREAKBULK	63.2	18.5	130	12,525	10,333			10,000	16,675			
CORNELL VICTORY	BREAKBULK	45.2	15.8	240	10,714	8,839			6,611	11,330			
COUNCIL BLUFFS VICTORY	BREAKBULK	45.3	15.8	240	10,825	8,931			6,611	11,330			
CRACKER STATE MARINER	BREAKBULK	54.2	20.0	180	13,409	11,062			13,250	15,800			
DE PAUW VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
DRAKE VICTORY	BREAKBULK	45.2	15.8	240	10,681	8,812			6,611	11,330			
DUKE VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
DURANGO VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
EARLHAM VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,611	11,330			
ELKO VICTORY	BREAKBULK	45.4	15.8	240	10,681	8,812			6,611	11,330			
ELMIRA VICTORY	BREAKBULK	44.2	17.0	200	10,669	8,802			6,463	11,330			
ENID VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,611	11,330			

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	BCF (X00)	DWT(L/T)	CARGO DWT(S/T)	TEU	SQ.FT (RO-RO)	SQ.FT.	MEAS TONS	MEAS TON CONT	TANKER BBLS	PASSENGERS
GAINESVILLE VICTORY	BREAKBULK	44.3	17.0	200	10,712	8,837			6,463	11,330			
GLEN	BREAKBULK	61.2	18.0	140	12,391	10,223			9,000	13,100			
GROVE CITY VICTORY	BREAKBULK	45.2	15.8	240	10,681	8,812			6,611	11,330			
HALAULA VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
HAMILTON VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,611	11,330			
HANNIBAL VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
HARVARD VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
HIGH POINT VICTORY	BREAKBULK	45.3	15.8	240	10,584	8,732			6,611	11,330			
HOBART VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,611	11,330			
HOPE VICTORY	BREAKBULK	45.2	15.8	240	10,681	8,812			6,611	11,330			
JOPLIN VICTORY	BREAKBULK	44.2	17.0	240	10,702	8,829			6,463	11,330			
LAHAINA VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
LAKEWOOD VICTORY	BREAKBULK	44.4	15.8	240	10,681	8,812			6,611	11,330			
LANE VICTORY	BREAKBULK	45.2	15.8	240	10,719	8,843			6,611	11,330			
LAS VEGAS VICTORY	BREAKBULK	44.4	15.8	240	10,681	8,812			6,611	11,330			
LINDENWOOD HAVEN VICTORY	BREAKBULK	44.0	15.8	240	10,915	9,005			6,611	11,330			
LOYOLA VICTORY	BREAKBULK	45.0	15.8	240	10,681	8,812			6,611	11,330			
LYNN VICTORY	BREAKBULK	45.0	15.8	240	10,584	8,732			6,611	11,330			
MALDEN VICTORY	BREAKBULK	44.4	15.8	240	10,584	8,732			6,611	11,330			
MANDERSON VICTORY	BREAKBULK	45.4	15.8	240	10,681	8,812			6,611	11,330			
MASSILLON VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
MAYFIELD VICTORY	BREAKBULK	44.4	15.8	240	10,631	8,771			6,611	11,330			
MEREDITH VICTORY	BREAKBULK	45.3	15.8	240	10,719	8,843			6,611	11,330			
MIRFAK	BREAKBULK	57.0	13.0	280	1,850					2,325			
MUHLENBERG VICTORY	BREAKBULK	45.3	15.8	240	10,584	8,732			6,611	11,330			
NEWCASTLE VICTORY	BREAKBULK	44.4	15.8	240	10,681	8,812			6,611	11,330			
OCALA VICTORY	BREAKBULK	45.1	15.8	240	10,584	8,732			6,611	11,330			
OCCIDENTAL VICTORY	BREAKBULK	45.2	15.8	240	10,725	8,848			6,611	11,330			
OSHKOSH VICTORY	BREAKBULK	45.3	15.8	240	10,755	8,873			6,611	11,330			
PACIFIC VICTORY	BREAKBULK	45.3	15.8	240	10,719	8,843			6,611	11,330			
PAN AMERICAN VICTORY	BREAKBULK	45.2	15.8	240	10,681	8,812			6,611	11,330			
PINE BLUFF VICTORY	BREAKBULK	45.3	15.8	240	10,719	8,843			6,611	11,330			
PRINCETON VICTORY	BREAKBULK	45.1	15.8	240	10,681	8,812			6,611	11,330			
PURDUE VICTORY	BREAKBULK	45.2	15.8	240	10,681	8,812			6,611	11,330			
QUEENS VICTORY	BREAKBULK	45.2	15.8	240	10,725	8,848			6,611	11,330			
RED OAK VICTORY	BREAKBULK	45.4	15.8	240	10,681	8,812			6,611	11,330			
RIDER VICTORY	BREAKBULK	45.2	15.8	240	10,714	8,839			6,611	11,330			
SAN MATEO VICTORY	BREAKBULK	45.3	15.8	240	10,681	8,812			6,611	11,330			
SANTA BARBARA	BREAKBULK	67.3	20.0	120	12,699	10,477			13,500	18,775			
SANTA CLARA	BREAKBULK	66.4	20.0	120	12,624	10,415			13,500	18,775			
SANTA CRUZ	BREAKBULK	66.3	20.0	120	12,631	10,421			13,500	18,775			
SANTA ELENA	BREAKBULK	67.2	20.0	120	12,678	10,459			13,500	18,775			
SANTA ISABEL	BREAKBULK	67.3	20.0	120	12,677	10,459			13,500	18,775			
SANTA LUCIA	BREAKBULK	66.2	20.0	120	12,693	10,472			13,500	18,775			
SELMA VICTORY	BREAKBULK	44.3	17.0	200	10,712	8,837			6,463	11,330			
SIOUX FALLS VICTORY	BREAKBULK	45.1	15.8	240	10,699	8,827			6,611	11,330			
SOUTHWESTERN VICTORY	BREAKBULK	45.2	15.8	240	10,725	8,848			6,611	11,330			
ST AUGUSTINE VICTORY	BREAKBULK	45.3	15.8	240	10,584	8,732			6,611	11,330			
TUCSON VICTORY	BREAKBULK	45.3	15.8	240	10,719	8,843			6,611	11,330			
TULANE VICTORY	BREAKBULK	45.2	15.8	240	10,681	8,812			6,611	11,330			
VANDERBILT VICTORY	BREAKBULK	45.2	15.8	240	10,714	8,839			6,611	11,330			
WAYNE VICTORY	BREAKBULK	45.2	15.8	240	10,719	8,843			6,611	11,330			
WHITTIER VICTORY	BREAKBULK	45.3	15.8	240	10,719	8,843			6,611	11,330			

VESSEL NAME	SHIP TYPE	YEAR BUILT	SPEED	RCE (X00)	DWT(L/T)	CARGO DWT(S/T)	TEU	SQ.FT (RO-RO)	SQ.FT.	MEAS TONS	MEAS TON CONT	TANKER BBLS	PASSENGERS
WINTHROP VICTORY	BREAKBULK	45.2	15.3	240	10,725	8,848			6,611	11,330			
AMERICAN ALTAIR	CONT-BB	65.1	21.0	170	12,763	10,529	521		15,000	10,691	14,914		
AMERICAN DRACO	CONT-BB	65.3	21.0	170	12,763	10,529	521		15,000	10,691	14,914		
BRINTON LYKES	CONT-BB	62.2	18.0	231	14,286	11,786	76		13,000	17,575	2,178		
EXPORT CHALLENGER	CONT-BB	63.2	18.5	130	12,525	10,333	439		10,000	16,675	12,555		
LINCOLN	CONT-BB	61.2	20.0	140	14,244	11,751	244		13,000	8,815	6,985		
PRESIDENT	CONT-BB	61.3	20.0	140	14,244	11,751	244		13,000	8,815	6,985		
SHIRLEY LYKES	CONT-BB	62.3	18.0	223	14,286	11,786	246		13,000	17,575	7,048		
SOLON TURMAN	CONT-BB	61.0	17.4	231	11,343	9,358	76		13,000	17,575	2,178		
DIAMOND STATE	CONT-NSS	62.2	20.0	150	19,871	16,294	1,124				32,175		
AMERICAN BANKER	CONT-SS	62.3	20.0	150	19,272	15,899	1,012				28,969		
EQUALITY STATE	CONT-SS	61.4	20.0	150	19,272	15,899	1,012				28,969		
JOHN HENRY	RO-RO	78.4	13.0	100	2,626	2,166		12,000					
PAUL BUNYAN	RO-RO	79.1	13.0	100	2,626	2,166		12,000					
OHIO	SEATRAIN	44.1	16.0	120	12,293	10,142		68,000					
TANKERS:													
BEAUJOLAIS	CRUDE	54.1	16.0	170	28,800							225,000	
BRAZOS	PRODUCT	45.2	14.5	125	23,969							204,000	
CHANCELLORSVILLE	PRODUCT	43.4	16.5	88	25,194							212,000	
CHESAPEAKE	PRODUCT	64.4	16.0	71	50,000							338,000	
CONNECTICUT	PRODUCT	58.3	17.8	228	38,240							280,000	
EXXON GETTYSBURG	PRODUCT	57.1	18.0	70	39,029							312,000	
FLORENCE	PRODUCT	54.1	16.0	150	28,518							233,000	
MAUMEE	PRODUCT	56.4	18.0	180	26,875							187,000	
MEACHEM	PRODUCT	57.3	16.0	120	31,145							250,000	
MISSION SANTA YNEZ	PRODUCT	44.1	14.0	98	17,056							139,000	
MOUNT VERNON VICTORY	CRUDE	61.1	16.0	170	49,200							367,000	
MOUNT WASHINGTON	CRUDE	63.4	17.0	130	49,500							367,000	
NAECO	PRODUCT	57.3	16.0	106	31,145							250,000	
PETERSBURG	CRUDE	63.2	16.0	80	50,100							367,000	
PRIDE II	PRODUCT	59.3	17.0	120	29,200							250,000	
SAGAMORE	PRODUCT	59.0	13.0		2,700							18,000	
SAUGATUCK	PRODUCT	42.4	14.0	110	16,500							139,000	
TEXACO MARYLAND	PRODUCT	63.3	16.0	170	26,600							208,000	
YUKON	PRODUCT	57.2	18.0	180	26,943							187,000	
PASSENGER:													
GEN A M PATCH	PASSENGER	44.4	15.0	150	9,971	4,986				2,350			1,800
GEN E PATRICK	PASSENGER	45.1	15.0	150	9,942	4,971				2,550			1,797
GEN JOHN POPE	PASSENGER	43.3	11.0	110	7,479	3,740				1,725			3,825
GEN H ROSE	PASSENGER	45.3	15.0	150	9,937	4,969				2,400			1,761
GEN S B BUCKNER	PASSENGER	45.1	15.0	150	9,924	4,962				2,350			1,743

JULY 1988 EUSC FLEET
(MILITARILY USEFUL SHIPS ONLY)

DRY CARGO:

NAME	FLAG	CATEGORY	YEAR BUILT	SPEED	DWT
ACADIA FOREST	LI	BARGE TRAN	69	19.0	49,047
ATLANTIC FOREST	LI	BARGE TRAN	70	18.0	49,071
RHINE FOREST	LI	BARGE TRAN	72	18.0	44,094
SPRUCE	LI	BARGE TRAN	75	10.0	8,043
GAFU	PA	BREAKBULK	87	17.0	6,890
HARBEL CUTLASS	LI	BREAKBULK	80	15.0	11,548
HARBEL TAPPER	LI	BREAKBULK	81	15.0	11,499
SUNBELT DIXIE	LI	CAR CARRIER	78	16.0	12,730
SANDYS BAY	LI	CONT-NSS	84	16.0	11,894
SEAWARD BAY	PA	CONT-NSS	83	16.0	11,875
SOMMERS BAY	PA	CONT-NSS	83	16.0	11,893
WORLD LYNX	LI	CONT-NSS	79	17.3	13,348
SHELLY BAY	PA	CONT-SS	83	16.0	11,876
CONDATA	HO	REFRIGERATOR	68	20.0	10,023
CORAL REEFER	PA	REFRIGERATOR	68	19.0	6,061
ISADORE HECHT	PA	REFRIGERATOR	64	19.0	6,198
OAHU REX	PA	REFRIGERATOR	86	17.0	6,450
OTARU REX	PA	REFRIGERATOR	86	17.0	6,427
SHOFU	PA	REFRIGERATOR	86	17.0	6,429

PASSENGER:

BERMUDA STAR	PA	PASSENGER	58	21.0	8,568
CANADA STAR	PA	PASSENGER	58	23.0	5,050
CARNIVALE	PA	PASSENGER	56	19.0	8,772
CELEBRATION	LI	PASSENGER	86	19.0	6,453
FESTIVALE	PA	PASSENGER	61	23.0	16,343
HOLIDAY	PA	PASSENGER	85	22.0	7,073
JUBILEE	LI	PASSENGER	86	19.0	6,351
MARDI GRAS	PA	PASSENGER	61	20.0	9,401
ROYALE	PA	PASSENGER	58	20.0	5,582
STARSHIP OCEANIC	PA	PASSENGER	65	20.0	8,738
TROPICALE	LI	PASSENGER	81	19.0	6,549

TANKERS:

ARMAND HAMMER	LI	CHEMICAL	67	15.0	60,763
CHIPPEWA	LI	CHEMICAL	81	14.5	19,639
KEIFU	PA	CHEMICAL	87	13.3	12,541
MOBIL CHALLANGE	LI	CHEMICAL	83	15.0	39,371
MOBIL COURAGE	LI	CHEMICAL	83	15.0	39,776
NORDIC SUN	LI	CHEMICAL	81	14.0	19,980

NAME	FLAG	CATEGORY	YEAR BUILT	SPEED	DWT
OWL TRANSPORTER	LI	CHEMICAL	83	15.0	39,742
PETROS	LI	CHEMICAL	84	15.0	39,724
AFRAN ZENITH	LI	CRUDE	72	16.0	96,716
ATLANTIA	LI	CRUDE	79	14.0	97,124
BALTIMORE SEA	LI	CRUDE	69	15.0	79,314
BRISBANE SEA	LI	CRUDE	68	16.0	73,994
CHARLES B. RENFREW	BA	CRUDE			77,414
CHEVRON PACIFIC	LI	CRUDE	83	15.0	34,950
COROLLA	PA	CRUDE	75	15.0	81,552
ESSO ALBANY	LI	CRUDE	73	15.0	23,694
ESSO BAYWAY	LI	CRUDE	78	16.0	50,915
ESSO CORAL GABLES	LI	CRUDE	75	15.0	38,691
ESSO KAOHSIUNG	BA	CRUDE	83	15.0	88,649
ESSO NASSAU	BA	CRUDE	82	15.0	88,429
ESSO PORTLAND	LI	CRUDE	78	16.0	50,888
GEO H WEYERHAEUSER	BA	CRUDE	81	15.0	35,035
GLADYS	PA	CRUDE	76	15.0	81,564
KENNETH E HILL	BA	CRUDE	79	16.0	79,990
MAJESTIC PRIDE	PA	CRUDE	75	15.0	40,633
MOBIL ENGINEER	LI	CRUDE	73	15.0	32,590
MOBIL NAVIGATOR	LI	CRUDE	73	16.0	32,590
MOBIL VALIANT	LI	CRUDE	82	15.0	81,282
MOBIL VANGUARD	LI	CRUDE	82	15.0	81,283
OCEAN VOYAGER	LI	CRUDE	73	16.0	72,347
PHILLIPS ARKANSAS	LI	CRUDE	80	16.0	54,026
PHILLIPS MEXICO	LI	CRUDE	79	15.0	54,057
PHILLIPS OKLAHOMA	LI	CRUDE	79	15.0	54,050
PHILLIPS VENEZUELA	LI	CRUDE	79	15.0	54,049
R. HALDEAN	BA	CRUDE			77,414
REBECCA	LI	CRUDE	84	15.0	92,752
SAMUEL B ARMACOST	BA	CRUDE	82	15.0	35,607
SAVANNAH SEA	LI	CRUDE	70	16.0	78,680
TEXAS CITY SEA	LI	CRUDE	70	16.0	78,696
VENUS V	PA	CRUDE	81	14.0	97,536
VESTA	PA	CRUDE	80	14.0	97,602
WILLIAM E MUSSMAN	LI	CRUDE	79	16.0	81,273
YORKTOWN SEA	LI	CRUDE	69	16.0	78,314
EBRO	LI	ORE/BULK/OIL	78	15.0	71,882
MARLIN	LI	ORE/BULK/OIL	77	13.0	15,000
TARPON	LI	ORE/BULK/OIL	77	13.0	14,924
ALDEN W CLAUSEN	LI	TANKER	81	15.0	35,587
BERYL	LI	TANKER	86	15.4	82,087
BRAE TRADER	LI	TANKER	75	16.0	89,730
CANOPUS	LI	TANKER	81	15.0	31,309
CARLA A HILLS	LI	TANKER	81	15.0	35,596
CELTIC TRADER	LI	TANKER	75	15.5	88,070
CONASTOGA	LI	TANKER	72	16.0	29,931
CORSICANA	LI	TANKER	73	15.0	29,931
ESSO BANGKOK	LI	TANKER	68	14.0	22,755
ESSO BAYONNE	LI	TANKER	74	15.0	29,634
ESSO BOMBAY	BA	TANKER	68	14.0	22,755
ESSO GUATEMALA	LI	TANKER	73	15.0	29,364
ESSO PROVIDENCE	LI	TANKER	74	15.0	22,711

NAME	FLAG	CATEGORY	YEAR BUILT	SPEED	DWT
ESSO PUERTO RICO	BA	TANKER	75	14.0	38,721
ESSO ST PETERSBURG	LI	TANKER	74	14.0	22,691
FELANIA	LI	TANKER	75	15.0	32,230
FELIPES	LI	TANKER	75	15.0	32,230
FICUS	LI	TANKER	76	15.0	32,230
FLAMMULINA	LI	TANKER	76	15.0	32,230
FOSSARINA	LI	TANKER	76	15.0	32,230
FOSSARUS	LI	TANKER	76	15.0	32,230
FULGAR	LI	TANKER	74	15.0	32,230
FUSUS	LI	TANKER	75	15.0	32,230
JULIE N	LI	TANKER	82	15.0	29,994
JUPITER	LI	TANKER	75	16.0	18,269
KENNETH T DERR	BA	TANKER	82	15.0	35,026
LOIRE	LI	TANKER	81	15.0	65,700
LUCY	LI	TANKER	85	15.0	38,300
MARY ANN	LI	TANKER	86	15.0	65,000
MERCURY	LI	TANKER	74	16.0	32,116
MOBIL ENDEAVOUR	LI	TANKER	81	15.0	38,481
MOBIL ENDURANCE	LI	TANKER	82	15.0	38,529
MOBIL ENTERPRISE	LI	TANKER	83	15.0	38,452
MOBIL MARKETER	LI	TANKER	74	15.0	31,102
MOBIL PRODUCER	LI	TANKER	74	15.0	31,102
NILE	LI	TANKER	81	15.0	65,755
OCEAN CHALLANGER	LI	TANKER	87	14.0	39,370
OCEAN CONQUEROR	LI	TANKER	87	14.0	39,103
OTTAWA	LI	TANKER	76	15.0	39,732
PACIFIC HUNTER	LI	TANKER	79	15.0	32,109
PLUTO	LI	TANKER	81	17.0	31,303
SACHEM	LI	TANKER	72	15.5	29,434
SAGUENAY	LI	TANKER	76	15.0	39,733
SASSTOWN	LI	TANKER	43	14.0	30,331
SATUCKET	LI	TANKER	71	15.5	29,918
SUZANNE	LI	TANKER	80	15.0	65,000
TEXACO BOGOTA	BA	TANKER	59	14.0	22,455
TEXACO MAINE	PA	TANKER	59	16.0	44,907
TEXACO NORGE	BA	TANKER	62	15.0	21,539
TEXACO OSLO	BA	TANKER	60	14.0	20,028
TEXACO SKANDINAVIA	BA	TANKER	62	15.0	21,539
TIMBO	LI	TANKER	43	14.0	30,304
VOLGA	LI	TANKER	81	15.0	65,689

APPENDIX B-8

DISPOSITION OF FORMER UNITED STATES LINES SHIPS

On November 24, 1986, United States Lines filed for Chapter 11 protection under the bankruptcy laws. Subsequently, United States Lines ceased all operations and was forced to dispose of its vessels. Appendix B-8 provides the names of the ships in the United States Lines fleet as of December 1986 and the current ship name, status, and owner for each vessel.

The AMERICAN HAWAII, AMERICAN MICHIGAN, and AMERICAN NORTH CAROLINA were on charter to United States Lines at the time of the bankruptcy. The RESOLUTE, ALLISON LYKES, MALLORY LYKES, and STELLA LYKES were chartered out to other companies at the time of bankruptcy.

Appendix B-7 contains a description of the ship type terminology used in Appendix B-8.

APPENDIX B-8

DISPOSITION OF FORMER UNITED STATES LINES SHIPS

	United States Lines Name as of December 1986	Current Ship Name	Ship Type	Current Status	Owner/ Operator
1.	American Alabama	Sea-Land Achiever	CONT-NSS	Operating	Sea-Land
2.	American California	Sea-Land Commitment	CONT-NSS	Operating	Sea-Land
3.	American Illinois	Sea-Land Quality	CONT-NSS	Operating	Sea-Land
4.	American Kentucky	Galveston Bay	CONT-NSS	Operating	Sea-Land
5.	American Maine	Sea-Land Value	CONT-NSS	Operating	Sea-Land
6.	American Nebraska	Nedlloyd Hudson	CONT-NSS	Operating	Sea-Land
7.	American New Jersey	Raleigh Bay	CONT-NSS	Operating	Sea-Land
8.	American New York	Nedlloyd Holland	CONT-NSS	Operating	Sea-Land
9.	American Oklahoma	Sea-Land Atlantic	CONT-NSS	Operating	Sea-Land
10.	American Utah	Newark Bay	CONT-NSS	Operating	Sea-Land
11.	American Virginia	Sea-Land Integrity	CONT-NSS	Operating	Sea-Land
12.	American Washington	Sea-Land Performance	CONT-NSS	Operating	Sea-Land
13.	American Entente	Sea-Land Trader	CONT-NSS	Operating	Sea-Land
14.	American Envoy	Sea-Land Navigator	CONT-NSS	Operating	Sea-Land
15.	American Liberty	Sea-Land Discovery	CONT-NSS	Operating	Sea-Land

United States Lines Name as of December 1986	Current Ship Name	Ship Type	Current Status	Owner/ Operator
16. American Pioneer	Sea-Land Pacific	CONT-NSS	Operating	Sea-Land
17. American Puritan	Sea-Land Enterprise	CONT-NSS	Operating	Sea-Land
18. American Marketer	Sea-Land Expedition	CONT-NSS	Operating	Sea-Land
19. American Merchant	Sea-Land Hawaii	CONT-NSS	Operating	Sea-Land
20. American Georgia	Chesapeake Bay	CONT-NSS	Operating	Topgallant
21. American Ohio	Delaware Bay	CONT-NSS	Operating	Topgallant
22. American Aquarius	Carolina	CONT-NSS	Operating	PRMSA
23. American Lynx	Mayaguez	CONT-NSS	Operating	PRMSA
24. American Apollo	Nuevo San Juan	CONT-NSS	Operating	PRMSA
25. American Astronaut	Guayama	CONT-NSS	Operating	PRMSA
26. American Lancer	Hymcao	CONT-NSS	Operating	PRMSA
27. American Hawaii	Sea Fox	CONT RO-RO	Operating	Crowley
28. American Michigan	Sea Lion	CONT RO-RO	Operating	Crowley
29. American North Carolina	Sea Wolf	CONT RO-RO	Operating	Crowley
30. Resolute	American Resolute	CONT-NSS	Operating	Farrell

	United States Lines Name as of December 1986	Current Ship Name	Ship Type	Current Status	Owner/ Operator
31.	Allison Lykes	Allison Lykes	CONT-NSS	Operating	Lykes
32.	Mallory Lykes	Mallory Lykes	CONT-NSS	Operating	Lykes
33.	Stella Lykes	Stella Lykes	CONT-NSS	Operating	AFRAM
34.	Rapid	Cape Nome	CONT RO-RO	Laid up/RRF	U.S. Government
35.	Rover	Rover	CONT RO-RO	MSC Charter	Central Gulf
36.	American Monarch	American Monarch	CONT-BB	Laid up	MPM Trans.
37.	American Spitfire	American Spitfire	CONT-BB	Laid up	MPM Trans.
38.	American Titan	American Titan	CONT-BB	Laid up	MPM Trans.
39.	American Trojan	American Trojan	CONT-BB	MSC charter	MPM Trans.
40.	American Lark	Sea-Land Crusader	CONT-NSS	Operating	Sea-Land
41.	American Legion	Sea-Land Legion	CONT-NSS	Operating	Sea-Land
42.	American Banker	American Banker	CONT-NSS	Laid up/NDRF	U.S. Government
43.	American Builder	Equality State	CONT-NSS	Laid up/NDRF	U.S. Government

APPENDIX B-9

COMPARISON OF UNITED STATES SHIP OPERATING COMPANIES 1970 AND 1987

The tables on the following pages provide a comparison of the United States companies that operated United States flag vessels in 1970 and the companies that operated United States flag vessels at the end of 1987. The companies are grouped into three types: liner, tanker, and dry bulk. The ships shown for each company include ships of over 1,000 gross tons that were operating in the foreign or domestic trades (excluding the Great Lakes), or on charter to the Military Sealift Command (MSC).

In 1970 there were 21 liner companies operating a total of 458 ships, while at the end of 1987 there were only 14 companies operating 137 ships.

There were 68 companies operating a total of 299 tankers in 1970, but at the end of 1987 there were only 48 companies operating 238 tankers.

The small United States dry bulk fleet has also declined since 1970, when 21 companies operated a total of 32 dry bulk carriers. At the end of 1987, there were 16 companies operating 26 bulk ships.

The **Remarks** column provides the best information available to the Commission about when companies went out of business, sold their vessels, changed company name or merged, or acquired ships from other companies.

COMPANIES OPERATING UNITED STATES FLAG LINERS

Company	Number of Ships 1970	 1987	Remarks
Alaskan Steamship	6	-	Ceased operations, year unknown
American Export ISB	30	-	Acquired by Farrell Lines, Inc., in 1978
American Mail Lines	10	-	Merged with American President Lines, Ltd., in 1973
American President Lines, Ltd.	22	24	Merged with American Mail Lines in 1973
Central Gulf Lines, Inc.	11	8	In 1987, operating two car carriers in commercial service and six ships chartered to MSC
Columbia Steamship	12	-	Out of business in 1970
Crowley Maritime Corp.	-	7	Acquired Delta Steamship Lines in 1982. Sold assets of Delta Steamship Lines to United States Lines, Inc., in 1985
Delta Steamship Lines	13	-	Acquired by Crowley Maritime Corp. in 1982
Farrell Lines, Inc.	15	6	Acquired American Export ISB in 1978
Fednav Lakes Services	-	2	Ceased operations in 1988; ships acquired for the RRF
Gulf and South American	5	-	Acquired by Lykes Bros. Steamship Co., Inc., in 1971
Island Shipping Lines	-	2	Out of business in 1988
Lykes Bros. Steamship Co., Inc.	57	31	Acquired Gulf and South American in 1971. Three ships on charter to MSC included in 1987 total

COMPANIES OPERATING UNITED STATES FLAG LINERS
(Continued)

Company	Number of Ships 1970	 1987	Remarks
Matson Navigation Co.	15	7	
Moore-McCormack Lines	34	-	Acquired by United States Lines, Inc., in 1983
Oceanic Steamship	3	-	Purchased by Pacific Far East Lines in 1971
Pacific Far East Lines	15	-	Purchased Oceanic Steamship in 1971. Went into receivership in 1978
Puerto Rico Maritime Shipping Authority (PRMSA)	-	8	Established in 1974 by the government of Puerto Rico; also known as Navieras de Puerto Rico
Prudential-Grace Lines	22	-	Filed Chapter 11 in May 1986; now out of business
Rainbow Navigation	-	1	Established in 1984
Sea-Land Service, Inc.	44	31	
Seatrain	26	-	Bankrupt in 1981
States Marine Line	48	-	Out of business in 1973
States Steamship	13	-	Bankrupt in 1978
Topgallant Group, Inc.	-	2	
Totem Ocean Trailer Express, Inc.	-	2	Established in 1983
United States Lines, Inc.	30	-	Acquired Moore-McCormack Lines in 1983, and Delta Steamship Lines in 1985. Filed Chapter 11 in November 1986; now out of business

COMPANIES OPERATING UNITED STATES FLAG LINERS
(Continued)

Company	Number of Ships 1970	Number of Ships 1987	Remarks
Waterman Steamship	27	6	Filed Chapter 11 in December 1983; out of Chapter 11 in July 1986. Operating three ships in commercial service and three on charter to MSC
Total Liner ships:	458	137	

COMPANIES OPERATING UNITED STATES FLAG TANKERS

Company	Number of Ships 1970	Number of Ships 1987	Remarks
Academy Tankers	2	-	Ceased operations in 1977
Allied Tankers	1	-	Ceased operations in 1971
American Foreign Shipping Co.	1	-	Ceased operations in 1984
American Gulf	-	1	
American Heavy Lift Shipping Co.	-	4	
American Maritime Transport, Inc.	-	1	
American Oil Co.	8	-	Ceased operations in 1986
American Ship Management	-	1	
American Trading & Transport Corp.	7	5	
Atlantic Richfield/ Arco Marine	9	10	
Atlantic Tankships Inc.	-	1	
Avon Marine Corp.	-	2	
Bay Tankers, Inc.	-	2	
Boston VLCC	-	3	
Cayuga Steamship Co.	1	-	Ceased operations in 1970
Charles Kurz and Co., Inc.	1	-	Vessel scrapped in 1975

COMPANIES OPERATING UNITED STATES FLAG TANKERS
(Continued)

Company	Number of Ships 1970	1987	Remarks
Chevron Oil Co.	2	7	Subsidiary of Standard Oil Co. of California until 1978 when Standard Oil Co. of California changed name to Chevron Corp. and consolidated tankers under Chevron Oil Corp. Acquired Gulf Oil Corp. in 1985
Coastal Tankships	-	1	
Cohansey Steamship Co.	1	-	Ceased operations in 1970
Colonial Tankers Corp.	1	-	Ceased operations in 1973
Commerce Tankers Corp.	2	-	Ceased operations in 1973
Connecticut Transport	1	-	Acquired by Ogden Marine, Inc. (OMI), in 1983
Cove Tankers	-	3	
Crest Tankers, Inc.	-	6	
Delaware Marine, Inc.	1	-	Ceased operations in 1970
Diesel Tanker Ira S. Bushey, Inc.	5	-	Acquired by Hess Shipping Corp. in 1984
Eagle Terminal Tankers, Inc.	4	-	Ceased operations in 1978
Energy Ammonia Transportation Corp.	-	1	
Energy Transportation Corp.	-	8	
Exxon Transportation Co.	24	21	Changed name from Esso to Exxon in 1972
Falcon Carriers, Inc.	-	6	
Figueroa Tanker Co.	1	-	Ceased operations in 1972
Gen Marine Co.	-	3	

COMPANIES OPERATING UNITED STATES FLAG TANKERS
(Continued)

Company	Number of Ships 1970	Number of Ships 1987	Remarks
Getty Oil Co.	5	-	Acquired by Texaco, Inc., in 1983
Gleneagle Steamship Management Co., Inc.	-	11	
Gulf Oil Corp.	21	-	Acquired by Chevron Corp. in 1985
Hendy International	1	-	Assets bought by West Coast Shipping Co. in 1979
Hess Shipping Corp.	5	12	Acquired Diesel Tanker Ira S. Bushey, Inc., in 1984
Hudson Waterways Corp.	12	-	Ceased operations in 1980
Hvide Shipping, Inc.	-	4	
International Ocean Transport Co.	7	-	Ceased operations in 1979
International Ship Management & Agencies Services	-	1	
Interocean Management Corp.	-	4	
Kee Leasing Co.	1	-	Acquired by Trinidad Corp. in 1977
Keystone Shipping Co.	23	18	
Locust Tankers, Inc.	1	-	Ceased operations in 1983
Manhattan Tankers Co., Inc.	2	-	Ceased operations in 1984
Marine Carriers Corp.	2	-	Ceased operations in 1979
Marine Navigation Co.	1	-	Ceased operations in 1981
Marine Transport Lines	13	16	

COMPANIES OPERATING UNITED STATES FLAG TANKERS
(Continued)

Company	Number of Ships 1970	Number of Ships 1987	Remarks
Maritime Overseas Corp.	10	12	
Mathiasen's Tanker Industries, Inc.	2	-	Acquired by Trinidad Corp. in 1976
Mobil Oil Corp.	6	4	Changed name from Socony Mobil Oil, Inc., to Mobil Oil Corp. in 1985
Morania Tarpon, Inc.	1	-	Ceased operations in 1985
Moran Towing Co.	-	1	
Mormac Marine Transport, Inc.	-	5	
Ocean Carriers, Inc.	-	4	
Ocean Ships	-	5	
Ocean Shipping & Trading	-	1	
Offshore Services	1	-	Ceased operations in 1984
OMI Corp.	4	8	Changed name from Ogden Marine, Inc., to OMI in 1983. Acquired Penn Tanker Corp. in 1981 and Connecticut Transport in 1983
Oil Transport, Inc.	2	-	Ceased operations in 1976
Peerless No. Five Corp.	1	-	Ceased operations in 1975
Penn Tanker Corp.	3	-	Acquired by Ogden Marine, Inc. (OMI), in 1981
Pico Tankers Corp.	1	-	Acquired by Union Oil Co. of California in 1974
Pioneer Tankers, Inc.	2	-	Ceased operations in 1970
Poling Transportation	-	1	
Pure Oil Co.	2	-	Ceased tanker operations in 1981

COMPANIES OPERATING UNITED STATES FLAG TANKERS
(Continued)

Company	Number of Ships 1970	1987	Remarks
Rye Marine Corp.	1	-	Ceased operations in 1979
Sabine Towing & Transportation Co., Inc.	5	6	
Sea-Land Service, Inc.	5	-	Sold tankers in 1978
Sealift Bulkers	-	1	
Sealift Tankships	-	2	
Sea Transport Corp.	2	-	Ceased operations in 1978
Security Pacific National Bank	1	-	Ceased tanker operations in 1973
Sinclair Oil Co.	4	-	Ceased tanker operations in 1979
Socony Mobil Oil, Inc.	5	-	Name changed to Mobil Oil Corp. in 1985
Standard Oil Co. of California	15	-	Name changed to Chevron Corp. in 1978
Sun Oil Co.	8	7	
Tanker Four Lakes	2	-	Ceased operations in 1972
Tanker Management, Inc.	-	2	
Texaco, Inc.	21	13	Acquired Getty Oil Co. in 1983
Texas Sun Shipping, Inc.	-	1	
The Cabin Tanker, Inc.	1	-	Renamed Richmond Corp.; ceased operations in 1979
Tidewater Oil Co.	2	-	Ceased operations in 1979
Trinidad Corp.	6	4	Acquired Mathiasen's Tanker Industries, Inc. in 1976, and Kee Leasing Co. in 1977
Union Carbide Corp.	1	1	

COMPANIES OPERATING UNITED STATES FLAG TANKERS
(Continued)

Company	Number of Ships 1970	Number of Ships 1987	Remarks
Union Oil Co. of California	-	1	Acquired Pico Tankers Corp. in 1974
United States Lines, Inc.	1	-	Tanker sold in 1970
United States Steel Corp.	2	-	Tankers sold in 1977
United Vintners, Inc.	2	-	Ceased operations in 1975
Valentine Chemical Carriers, Inc.	1	-	Ceased operations in 1978
Vancor Steamship Co.	2	-	Ceased operations in 1978
Victory Carriers, Inc.	4	2	
Watters Marine, Inc.	-	1	
West Coast Shipping Co.	-	4	Acquired Hendy International in 1979
Western Ocean Transport	2	-	Ceased operations in 1980
Western Tankers Corp.	3	-	Ceased operations in 1972
World Wide Tankers, Inc.	1	-	Ceased operations in 1973
York Agents	1	-	Ceased operations in 1970
Total Tankers:	299	238	

COMPANIES OPERATING UNITED STATES FLAG BULK CARRIERS

Company	Number of Ships 1970	Number of Ships 1987	Remarks
Aeron Marine Shipping Co.	–	1	
Allied Towing	–	1	
American Bulk Carriers, Inc.	1	–	Ceased operations in 1973
American Maritime Transport	–	2	
Apex Marine Corp.	–	4	
California Rice Transport	–	1	
C. F. Industries, Inc.	–	1	
Empire Transport, Inc.	1	–	Vessel scrapped in 1982
Falcon Carriers, Inc.	–	3	
Freighters, Inc.	1	–	Vessel sold foreign in 1975
General Cargo Corp.	1	–	Vessel scrapped in 1973
Gulfcoast Transit Co.	–	1	
Intercontinental Carriers	1	–	Acquired by Maritime Overseas Corp. in 1973
Keva Corp.	1	–	Ceased operations in 1976
Keystone Shipping Co.	–	1	
Marine Carriers Corp.	2	–	Ceased operations in 1973
Marine Traders Inc.	1	–	Vessel scrapped in 1970
Marine Transport Lines, Inc.	5	1	
Maritime Overseas Corp.	–	2	Acquired Intercontinental Carriers in 1973
Matson Navigation Co.	1	–	Vessel scrapped in 1981
Meadowbrook Transport	1	–	Vessel scrapped in 1974

OPERATING UNITED STATES FLAG BULK CARRIERS
(Continued)

Company	Number of Ships 1970	Number of Ships 1987	Remarks
Mississippi Valley Barge Line Co.	1	-	Ceased operations in 1971
Ocean Clippers, Inc.	1	-	Ceased operations in 1978
Ogden Marine, Inc.	5	-	Name changed to OMI Corp. in 1983
OMI Corp.	-	2	Formerly Ogden Marine, Inc.
Overseas Carriers Corp.	1	-	Vessel scrapped in 1973
Pacific Gulf Marine	-	2	
Penn Navigation Co.	2	-	Ceased operations in 1974
Phoenix Bulkship	-	2	
Platte Transport, Inc.	1	-	Vessel sold foreign in 1974
Sea Liberties, Inc.	1	-	Vessel scrapped in 1971
Sealift Bulkers	-	1	
Sulpho Marine Transportation, Inc.	1	-	Ceased operations in 1970
Transport Commercial	1	-	Vessel scrapped in 1983
Winco Tankers, Inc.	2	-	Ceased operations in 1972
Zapata Gulf Marine	-	1	
Total Dry Bulk:	32	26	

APPENDIX C

UNITED STATES SEAGOING LABOR

APPENDICES C-1 AND C-2

SUMMARY OF SEAGOING LABOR

Summaries of seagoing labor and mobilization manning profiles for 1988 and for the year 2000 are contained in Appendices C-1 and C-2. Ship manning levels for the existing 1988 and the projected year 2000 United States flag merchant fleets were developed by the Commission with the assistance of Maritime Administration, Navy, Coast Guard, Military Sealift Command, and maritime industry personnel.

The Commission recognizes that peacetime manning levels on active United States flag merchant ships could differ from the manning levels required in time of war or national emergency. The Commission analyzed manning on active United States flag merchant ships (current and projected), made judgments about the utility of some billets during mobilization for war or national emergency, and determined billet requirements for merchant ships supporting national security objectives. The Commission then applied the mobilization billet requirements to the peacetime active merchant seamen work force to determine the surplus or shortfall in the number of merchant seamen required during mobilization for war or national emergency to man the United States flag merchant fleet (including Military Sealift Command chartered ships), the Ready Reserve Force (RRF), and the militarily useful ships in the National Defense Reserve Fleet.

Appendix C-1 shows the mobilization manning for the ships that would be required for strategic sealift and economic support during war or national emergency in 1988, comparing the active workforce with the number of billets, by qualification, required.

Appendix C-2 contains two analyses based on Commission fleet projections for the year 2000. Table 1 assumes the continuation of current government maritime policies and shows the projected mobilization manning required during war or national emergency in the year 2000 in the same manner as Appendix C-1. Table 2 shows manning for the same scenario assuming that the Commission's goal of a 650 ship United States flag fleet is attained. Both of the appendices are in the same format, which consists of four sections:

Section I, **MANNING FOR UNITED STATES FLAG MERCHANT SHIPS**, shows the peacetime billet requirement to operate the United States flag merchant fleet, the manpower requirement to mobilize active and reserve United States flag merchant ships, the merchant seamen available to fill the mobilization requirement, and the projected surplus or shortfall of merchant seamen after filling the mobilization requirement.

Section II, **MANNING FOR ADDITIONAL STRATEGIC SEALIFT SHIPS**, shows the mobilization billet requirement to provide sufficient strategic sealift capabilities during war or national emergency without regard to ship source, scheduling, availability, or attrition. The additional mobilization manpower needed for strategic sealift is calculated and a cumulative total is shown for the projected surplus or shortfall of merchant seamen existing after the manning of the United States flag merchant fleet and any other ships required to provide sufficient strategic sealift during mobilization.

Section III, **MANNING FOR ADDITIONAL ECONOMIC SUPPORT SHIPS**, shows the mobilization manpower required to provide the oceangoing shipping for the essential economic support of the United States during mobilization and the cumulative total mobilization manpower requirement.

Section IV, **SURPLUS (SHORTFALL) TO MEET TOTAL MANNING REQUIREMENTS**, shows the cumulative total projected surplus or shortfall of merchant seamen required to man the United States flag merchant fleet, and to provide sufficient strategic sealift and augment economic support during mobilization.

The data fields for the columns in each Section listed in Appendices C-1 and C-2 are defined as follows:

LICENSED - DECK: Billet for a merchant seaman who is a specially trained and qualified officer holding a federal license for operation of unlimited tonnage upon oceans and is authorized to be employed aboard a United States flag merchant ship in a licensed capacity in the deck department (for example: as master, chief mate, second mate, or third mate).

LICENSED - ENGINE: Billet for a merchant seaman who is a specially trained and qualified officer holding a federal license for operating steam or diesel engines of unlimited horsepower and is authorized to be employed aboard a United States flag merchant ship in a licensed capacity in the engine department (for example: as chief engineer, first assistant engineer, second assistant engineer, or third assistant engineer).

LICENSED - RADIO: Billet for a merchant seaman who is a specially trained and qualified radio officer holding a Federal Communications Commission license and a federal license as Radio Officer and is authorized to be employed aboard a United States flag merchant ship in the capacity of radio officer.

UNLICENSED - DECK: Billet for a merchant seaman holding a Merchant Mariner's Document who is specially trained and qualified to be employed aboard a United States flag merchant ship in an unlicensed capacity in the deck department (for example: as able-bodied seaman, ordinary seaman, or boatswain).

UNLICENSED - ENGINE: Billet for a merchant seaman holding a Merchant Mariner's Document who is specially trained and qualified to be employed aboard a United States flag merchant ship in an unlicensed capacity in the engine department (for example: as oiler, fireman, watertender, or wiper).

UNLICENSED - STEWARD: Billet for a merchant seaman holding a Merchant Mariner's Document who is specially trained and qualified to be employed aboard a United States flag merchant ship in an unlicensed capacity in the steward department (for example: as cook, baker, or utilityman).

TOTALS: The sum of the billets by each ship type or the manpower required to fill the billets.

I. MANNING FOR UNITED STATES FLAG MERCHANT SHIPS

The minimum billet and manpower required to operate the active and reserve ships in the United States flag fleet during a mobilization effort.

BILLETS ON ACTIVE UNITED STATES FLAG SHIPS: Active United States flag merchant ships, listed by cargo carrying type, that make up the United States flag merchant fleet. Ship types and number of ships for the year 1988 and for the year 2000 projections are taken from source data in Appendix B. Billet summaries for the year 1988 are from Appendix C-3, and for the year 2000 are from the Commission projection.

BILLETS ON UNITED STATES FLAG RESERVE SHIPS: United States flag merchant ships, listed by cargo carrying type, that make up the Maritime Administration's Ready Reserve Force (RRF) and the Military Sealift Command's Reduced Operating Status (ROS) fleet. Billet summaries for the year 1988 are from Appendix C-3, and for the year 2000 from the Commission projection.

TOTAL MOBILIZATION BILLETS: Sum of the number of billets for the **ACTIVE UNITED STATES FLAG SHIPS** and **UNITED STATES FLAG RESERVE SHIPS**. **TOTAL MOBILIZATION BILLETS** for passenger vessels have been adjusted for differences in passenger ship and troopship steward manning requirements (see Appendix C-3).

MOBILIZATION MANPOWER REQUIRED: The manpower, required during mobilization to operate the **ACTIVE UNITED STATES FLAG SHIPS** and **UNITED STATES FLAG RESERVE SHIPS.** The number was calculated by multiplying **TOTAL MOBILIZATION BILLETS** by 1.5, the men per billet ratio experienced for sustained operations during World War II and used by the Navy in its 1986 Manpower Study.

TOTAL ACTIVE SEAMEN: Data for the year 1988 was taken from the Maritime Administration's Seamen's Employment Analysis Output data through December 31, 1987. For the year 2000, **TOTAL ACTIVE SEAMEN** was estimated, based on the average historic peacetime ratio of two men per billet in the active United States flag fleet.

ACTIVE AVAILABLE SEAMEN: An estimate of the number of United States citizen merchant seamen who would be willing and able to serve at sea in time of emergency. The number was derived by multiplying **TOTAL ACTIVE SEAMEN** by 90 percent, the same availability factor used by the Navy in its 1986 Manpower Study.

SURPLUS (SHORTFALL) OF AVAILABLE ACTIVE SEAMEN TO MAN UNITED STATES FLAG MERCHANT SHIPS: The available workforce is compared to the mobilization manpower requirement to calculate a number for a surplus or shortfall of qualified personnel. The number, and whether it is a surplus or shortfall, was determined by subtracting **MOBILIZATION MANPOWER REQUIRED** from the number of **AVAILABLE ACTIVE SEAMEN.**

II. MANNING FOR ADDITIONAL STRATEGIC SEALIFT SHIPS

The mobilization manning requirement for sufficient strategic sealift during war or national emergency without regard to ship source, scheduling, availability, or attrition. The shortage of ships for the required strategic sealift was assumed to be made up from assets other than the **ACTIVE UNITED STATES FLAG SHIPS** and **UNITED STATES FLAG RESERVE SHIPS.**

ADDITIONAL MANPOWER REQUIRED FOR STRATEGIC SEALIFT SHIPS: Ship requirements derived from data in Appendix B. An 18 person crew was assumed for the additional ships required. The manpower number was calculated by multiplying the number of billets by the 1.5 men per billet ratio.

TOTAL MANPOWER REQUIRED FOR SECTIONS I AND II: Sum of **MOBILIZATION MANPOWER REQUIRED** from Section I and **ADDITIONAL MANPOWER REQUIRED FOR STRATEGIC SEALIFT SHIPS** from Section II.

SURPLUS (SHORTFALL) OF AVAILABLE ACTIVE SEAMEN TO MAN UNITED STATES FLAG MERCHANT SHIPS AND TO MEET STRATEGIC SEALIFT REQUIREMENTS: The available workforce was compared to the mobilization manpower requirement to arrive at a surplus or shortfall number. The number, and whether a surplus or shortfall, was determined by subtracting **TOTAL MANPOWER REQUIRED FOR SECTIONS I AND II** from the number of **AVAILABLE ACTIVE SEAMEN**.

III. MANNING FOR ADDITIONAL ECONOMIC SUPPORT SHIPS

The mobilization manning requirement for additional ships needed to provide essential economic shipping during war or national emergency without regard to ship source, scheduling, availability, or attrition. The shortage of ships for the additional economic sealift was assumed to be made up from assets other than the **ACTIVE UNITED STATES FLAG SHIPS** and **UNITED STATES FLAG RESERVE SHIPS**.

ADDITIONAL MANPOWER REQUIRED FOR ECONOMIC SUPPORT SHIPS: Ship requirements derived from data in Appendix B. An 18 person crew was assumed for the additional ships required. The manpower number was calculated by multiplying the number of billets by the 1.5 men per billet ratio.

TOTAL MANPOWER REQUIRED FOR SECTIONS I, II, AND III: Sum of **TOTAL MANPOWER REQUIRED FOR SECTIONS I AND II** and **ADDITIONAL MANPOWER REQUIRED FOR ECONOMIC SUPPORT SHIPS**.

IV. SURPLUS (SHORTFALL) TO MEET TOTAL MANNING REQUIREMENTS

The workforce, **AVAILABLE ACTIVE SEAMEN**, was compared to the sealift manpower requirement, **TOTAL MANPOWER REQUIREMENT FOR SECTIONS I, II, AND III**, to calculate the total surplus or shortfall of **AVAILABLE ACTIVE SEAMEN** to man ships necessary in mobilization for national defense or security objectives. To the extent that shipping shortfalls are filled by active United States flag merchant ships that contribute to increasing the size of the active seagoing workforce, the manpower shortage could be reduced.

APPENDIX C-1
SUMMARY OF SEAGOING LABOR - 1988
(As of July 1, 1988)

	LICENSED			UNLICENSED			
	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD	TOTALS
I. MANNING FOR UNITED STATES FLAG MERCHANT SHIPS							
BILLETS ON ACTIVE UNITED STATES FLAG SHIPS							
BILLETS ON DRY CARGO SHIPS (176 ships)	729	367	172	1,383	395	894	4,940
BILLETS ON BULK/PASSENGER SHIPS (30 ships)	125	143	23	291	200	369	1,156
BILLETS ON TANKERS (203 ships)	830	356	180	1,551	834	730	4,981
SUBTOTAL (Billets on 409 ships)	1,684	1,866	380	3,225	1,929	1,993	11,077
BILLETS ON UNITED STATES FLAG RESERVE SHIPS							
BILLETS ON RRF CARGO SHIPS (81 ships)	339	347	81	806	495	395	2,463
BILLETS ON RRF TANKERS (9 ships)	36	36	9	83	37	39	240
BILLETS ON RRF PASSENGER SHIP (1 ship)	4	6	1	9	6	5	31
BILLETS ON ROS SHIPS (10 ships)	40	48	10	98	97	96	389
SUBTOTAL (Billets on 101 ships)	419	437	101	996	635	535	3,123
TOTAL MOBILIZATION BILLETS (510 ships)	2,103	2,303	481	4,221	2,564	2,314	13,986
MOBILIZATION MANPOWER REQUIRED	3,155	3,455	722	6,332	3,846	3,471	20,981
TOTAL ACTIVE SEAMEN	3,590	4,276	775	6,966	4,175	4,938	24,720
AVAILABLE ACTIVE SEAMEN	3,231	3,848	698	6,269	3,758	4,444	22,248
SURPLUS (SHORTFALL) OF AVAILABLE ACTIVE SEAMEN TO MAN UNITED STATES FLAG MERCHANT SHIPS	77	394	(24)	(63)	(88)	973	1,269
II. MANNING FOR ADDITIONAL STRATEGIC SEALIFT SHIPS							
BILLETS ON UNIT EQUIPMENT CAPABLE SHIPS (59 ships)	236	236	0	354	118	118	1,062
BILLETS ON AMMUNITION/RESUPPLY SHIPS (24 ships)	96	96	0	144	48	48	432
BILLETS ON TANKERS (37 ships)	148	148	0	222	74	74	666
SUBTOTAL (Billets on 120 ships)	480	480	0	720	240	240	2,160
ADDITIONAL MANPOWER REQUIRED FOR STRATEGIC SEALIFT SHIPS	720	720	0	1,080	360	360	3,240
TOTAL MANPOWER REQUIRED FOR SECTIONS I AND II	3,875	4,175	722	7,412	4,206	3,831	24,219
SURPLUS (SHORTFALL) OF AVAILABLE ACTIVE SEAMEN TO MAN UNITED STATES FLAG MERCHANT SHIPS AND TO MEET STRATEGIC SEALIFT REQUIREMENTS	(644)	(326)	(24)	(1,142)	(449)	613	(1,971)
III. MANNING FOR ADDITIONAL ECONOMIC SUPPORT SHIPS							
BILLETS ON ECONOMIC SUPPORT SHIPS (20 ships)	80	80	0	120	40	40	360
ADDITIONAL MANPOWER REQUIRED FOR ECONOMIC SUPPORT SHIPS	120	120	0	180	60	60	540
TOTAL MANPOWER REQUIRED FOR SECTIONS I, II, AND III	3,995	4,295	722	7,592	4,266	3,891	24,759
IV. SURPLUS (SHORTFALL) TO MEET TOTAL MANNING REQUIREMENTS (650 ships)	(764)	(446)	(24)	(1,322)	(508)	553	(2,511)

APPENDIX C-2
Table 1
SUMMARY OF SEAGOING LABOR - YEAR 2000
(Projection Based on No Change in Current Policies)

	LICENSED			UNLICENSED			
	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD	TOTALS
I. MANNING FOR UNITED STATES FLAG MERCHANT SHIPS							
BILLETS ON ACTIVE UNITED STATES FLAG SHIPS							
BILLETS ON DRY CARGO SHIPS (100 ships)	404	435	99	658	385	399	2,380
BILLETS ON BULK/PASSENGER SHIPS (25 ships)	101	115	23	224	159	275	897
BILLETS ON TANKERS (92 ships)	381	394	75	666	305	311	2,132
SUBTOTAL (Billets on 217 ships)	886	944	197	1,548	849	985	5,409
BILLETS ON UNITED STATES FLAG RESERVE SHIPS							
BILLETS ON RRF CARGO SHIPS (100 ships)	415	428	100	969	594	177	2,683
BILLETS ON RRF TANKERS (32 ships)	128	127	31	262	141	127	816
BILLETS ON RRF PASSENGER SHIP (1 ship)	4	6	1	4	6	5	31
BILLETS ON FOS SHIPS (10 ships)	40	48	10	98	96	96	388
SUBTOTAL (Billets on 143 ships)	587	609	142	1,333	837	705	4,212
TOTAL MOBILIZATION BILLETS (360 ships)	1,473	1,553	339	2,884	1,686	1,176	9,413
MOBILIZATION MANPOWER REQUIRED	2,210	2,330	509	4,329	2,529	2,214	14,120
TOTAL ACTIVE SEAMEN	1,772	1,888	394	3,096	1,599	1,970	10,719
AVAILABLE ACTIVE SEAMEN	1,595	1,699	355	2,786	1,528	1,773	9,736
SURPLUS (SHORTFALL) OF AVAILABLE ACTIVE SEAMEN TO MAN UNITED STATES FLAG MERCHANT SHIPS	(615)	(630)	(154)	(1,543)	(1,001)	(441)	(4,384)
II. MANNING FOR ADDITIONAL STRATEGIC SEALIFT SHIPS							
BILLETS ON UNIT EQUIPMENT CAPABLE SHIPS (67 ships)	268	268	0	402	134	134	1,206
BILLETS ON AMMUNITION/RESUPPLY SHIPS (73 ships)	292	292	0	438	146	146	1,314
BILLETS ON TANKERS (112 ships)	448	448	0	672	224	224	2,016
SUBTOTAL (Billets on 252 ships)	1,008	1,008	0	1,512	504	504	4,536
ADDITIONAL MANPOWER REQUIRED FOR STRATEGIC SEALIFT SHIPS	1,512	1,512	0	2,268	756	756	6,804
TOTAL MANPOWER REQUIRED FOR SECTIONS I AND II	3,722	3,842	509	6,597	3,285	2,970	20,924
SURPLUS (SHORTFALL) OF AVAILABLE ACTIVE SEAMEN TO MAN UNITED STATES FLAG MERCHANT SHIPS AND TO MEET STRATEGIC SEALIFT REQUIREMENTS	(2,127)	(2,142)	(154)	(3,811)	(1,757)	(1,197)	(11,187)
III. MANNING FOR ADDITIONAL ECONOMIC SUPPORT SHIPS							
BILLETS ON ECONOMIC SUPPORT SHIPS (38 ships)	152	152	0	228	76	76	684
ADDITIONAL MANPOWER REQUIRED FOR ECONOMIC SUPPORT SHIPS	228	228	0	342	114	114	1,026
TOTAL MANPOWER REQUIRED FOR SECTIONS I, II, AND III	3,950	4,070	509	6,939	3,399	3,084	21,950
IV. SURPLUS (SHORTFALL) TO MEET TOTAL MANNING REQUIREMENTS (650 ships)	(2,355)	(2,370)	(154)	(4,153)	(1,871)	(1,311)	(12,213)

APPENDIX C-2
Table 2
SUMMARY OF SEAGOING LABOR - YEAR 2000
(Projection Based on Commission 650 Ship Fleet Goal)

	LICENSED			UNLICENSED			
	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD	TOTALS
I. MANNING FOR UNITED STATES FLAG MERCHANT SHIPS							
BILLETS ON ACTIVE UNITED STATES FLAG SHIPS							
BILLETS ON DRY CARGO SHIPS (100 ships)	404	435	99	658	385	399	2,380
BILLETS ON BULK/PASSENGER SHIPS (25 ships)	101	115	23	224	159	275	897
BILLETS ON TANKERS (92 ships)	381	394	75	666	305	311	2,132
BILLETS ON ADD-ON SHIPS (290 ships)	1,160	1,160	0	1,740	580	580	5,220
SUBTOTAL (Billets on 507 ships)	2,046	2,104	197	3,288	1,429	1,565	10,629
BILLETS ON UNITED STAES FLAG RESERVE SHIPS							
BILLETS ON RRF CARGO SHIPS (100 ships)	547	561	132	1,240	741	609	3,830
BILLETS ON RRF TANKERS (32 ships)							
BILLETS ON RRF PASSENGER SHIP (1 ship)							
BILLETS ON RCS SHIPS (10 ships)	40	48	10	98	96	96	388
SUBTOTAL (Billets on 143 ships)	587	609	142	1,338	837	705	4,218
TOTAL MOBILIZATION BILLETS (650 ships)	2,633	2,713	339	4,626	2,266	2,056	14,633
MOBILIZATION MANPOWER REQUIRED	3,950	4,070	509	6,939	3,399	3,084	21,950
TOTAL ACTIVE SEAMEN	4,092	4,208	394	6,576	2,958	3,130	21,358
AVAILABLE ACTIVE SEAMEN	3,683	3,787	355	5,918	2,572	2,817	19,132
SURPLUS (SHORTFALL) OF AVAILABLE ACTIVE SEAMEN TO MAN UNITED STATES FLAG MERCHANT SHIPS	(267)	(282)	(154)	(1,021)	(827)	(267)	(2,817)
II. MANNING FOR ADDITIONAL STRATEGIC SEALIFT SHIPS							
BILLETS ON UNIT EQUIPMENT CAPABLE SHIPS (0 ships)	0	0	0	0	0	0	0
BILLETS ON AMMUNITION/RESUPPLY SHIPS (0 ships)	0	0	0	0	0	0	0
BILLETS ON TANKERS (0 ships)	0	0	0	0	0	0	0
SUBTOTAL (Billets on 0 ships)	0	0	0	0	0	0	0
ADDITIONAL MANPOWER REQUIRED FOR STRATEGIC SEALIFT SHIPS	0	0	0	0	0	0	0
TOTAL MANPOWER REQUIRED FOR SECTIONS I AND II	3,950	4,070	509	6,939	3,399	3,084	21,950
SURPLUS (SHORTFALL) OF AVAILABLE ACTIVE SEAMEN TO MAN UNITED STATES FLAG MERCHANT FLEETS AND TO MEET STRATEGIC SEALIFT REQUIREMENTS	(267)	(282)	(154)	(1,021)	(827)	(267)	(2,817)
III. MANNING FOR ADDITIONAL ECONOMIC SUPPORT SHIPS							
BILLETS ON ECONOMIC SUPPORT SHIPS (0 ships)	0	0	0	0	0	0	0
ADDITIONAL MANPOWER REQUIRED FOR ECONOMIC SUPPORT SHIPS	0	0	0	0	0	0	0
TOTAL MANPOWER REQUIRED FOR SECTIONS I, II, AND III	3,950	4,070	509	6,939	3,399	3,084	21,950
IV. SURPLUS (SHORTFALL) TO MEET TOTAL MANNING REQUIREMENTS (650 ships)	(267)	(282)	(154)	(1,021)	(827)	(267)	(2,817)

APPENDIX C-3

1988 MANPOWER LISTS BY FLEET

Appendices C-1 and C-2 were based in part on an analysis of billet requirements for United States flag ships. Appendix C-3 lists the number of billets, on both government and privately owned United States flag ships, determined by the Commission as requiring manning in time of war or national emergency.

1988 MANPOWER LISTS include ships of the United States flag commercial fleet, the Ready Reserve Force (RRF), the National Defense Reserve Fleet (NDRF), and the Civil Service manned merchant ship portion of the Military Sealift Command (MSC). The July 1, 1988, billet requirements are listed by ship name, with official number where available. The ships are listed alphabetically by fleet in the following order:

UNITED STATES FLAG DRY CARGO SHIPS

UNITED STATES FLAG BULK AND PASSENGER SHIPS

UNITED STATES FLAG TANKERS

READY RESERVE FORCE SHIPS

MSC REDUCED OPERATING STATUS SHIPS

NATIONAL DEFENSE RESERVE FLEET SHIPS

The data fields contained in Appendix C-3 are defined as follows:

SHIP NAME: The registered name of the vessel. Entries are made alphabetically by type of vessel.

OFFICIAL NUMBER: A number assigned to a vessel documented under the laws of the United States. The official number remains assigned to the vessel throughout its documented existence, regardless of changes of ship name or owner.

LICENSED/UNLICENSED: The six categories of trained seamen and the total billets for each ship type were derived from the Seamen's Employment Analysis Ship Change File, provided by the Maritime Administration. A ship whose mobilization manning requirement has been estimated by the Commission is indicated by an asterisk (*). The majority of ships with estimated crews are over 40 years old (for example: the National Defense Reserve Fleet VICTORY ships), or have not been privately owned and operated commercially under the United States flag (for example: public vessels), or are passenger ships that would have reduced crews, particularly in their steward departments, when serving as troopships.

LICENSED - DECK: Billet requiring a merchant seaman who is a specially trained and qualified officer holding a federal license for operation of unlimited tonnage upon oceans and is authorized to be employed aboard a United States flag merchant ship in a licensed capacity in the deck department (for example: as master, chief mate, second mate, or third mate). **LICENSED DECK** billets are totaled at the end of the table.

LICENSED - ENGINE: Billet requiring a merchant seaman who is a specially trained and qualified officer holding a federal license for operating steam or diesel engines of unlimited horsepower and is authorized to be employed aboard a United States flag merchant ship in a licensed capacity in the engine department (for example: as chief engineer, first assistant engineer, second assistant engineer, or third assistant engineer). **LICENSED ENGINE** billets are totaled at the end of the table.

LICENSED - RADIO: Billet requiring a merchant seaman who is a specially trained and qualified radio officer holding a Federal Communications Commission license and a federal license as Radio Officer and is authorized to be employed aboard a United States flag merchant ship in the capacity of radio officer. **LICENSED RADIO** billets are totaled at the end of the table.

UNLICENSED - DECK: Billet requiring a merchant seaman holding a Merchant Mariner's Document who is specially trained and qualified to be employed aboard a United States flag merchant ship in an unlicensed capacity in the deck department (for example: as able-bodied seaman, ordinary seaman, or boatswain). **UNLICENSED DECK** billets are totaled at the end of the table.

UNLICENSED - ENGINE: Billet requiring a merchant seaman holding a Merchant Mariner's Document who is specially trained and qualified to be employed aboard a United States flag merchant ship in an unlicensed capacity in the engine department (for example: as oiler, fireman, watertender, or wiper). **UNLICENSED ENGINE** billets are totaled at the end of the table.

UNLICENSED - STEWARD: Billet requiring a merchant seaman holding a Merchant Mariner's Document who is specially trained and qualified to be employed aboard a United States flag merchant ship in an unlicensed capacity in the steward department. Steward billets for peacetime manning of passenger ships have been reduced to include only food-handling skills (for example: as cook, baker, or messmen). Billets for such personnel as bartenders, beauticians, entertainers, and other providers of hotel or passenger type services were excluded, since these skills would not be required on board ship during mobilization.

Steward billets for mobilization manning of passenger ships converted to troopships have been further reduced to provide only for feeding the crew and for some supervising of the military food service teams provided by the embarked troops. **UNLICENSED STEWARD** billets are totaled at the end of the table.

TOTALS: The sum of the billets by category is provided for each ship type along with the **GRAND TOTAL** of all billets required to man all the ships of each type.

TOTAL NUMBER OF SHIPS: The total number of ships by ship type is provided for each table.

The SS UNITED STATES is listed in the table for **U.S. FLAG BULK AND PASSENGER SHIPS** because, although the ship is now privately owned, it has not been operated since 1969, and has not been maintained by the United States government since 1980, it is still considered to be a potential mobilization asset by the Maritime Administration.

UNITED STATES FLAG DRY CARGO SHIPS - 1988
(AS OF 1 JULY 1988)

COMMERCIAL FLEET DRY CARGO SHIPS

SHIP NAME	OFF. NUMBER	LICENSED			UNLICENSED		
		DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
ADABELLE LYKES	668348	4	6	1	8	5	5
ALLISON LYKES	296632	4	6	1	10	6	7
ALMERIA LYKES	512593	4	6	1	9	6	7
AMBASSADOR	625498	4	4	1	6	4	3
AMERICAN APOLLO	529004	5	6	1	11	8	8
AMERICAN AQUARIUS	530999	5	6	1	11	8	8
AMERICAN ASTRONAUT	520694	5	6	1	11	8	8
AMERICAN CONDOR	676864	4	3	1	6	3	3
AMERICAN CORMORANT	688758	4	3	1	6	2	3
AMERICAN EAGLE	658479	4	3	1	6	3	3
AMERICAN FALCON	697393	4	3	1	6	3	3
AMERICAN KESTREL	530146	4	5	1	6	5	3
AMERICAN LANCER	514261	5	6	1	11	8	8
AMERICAN LYNX	517450	5	6	1	11	8	8
AMERICAN MONARCH	519937	5	5	1	10	6	7
AMERICAN RESERVIST	296947	5	6	1	11	7	8
AMERICAN RESOLUTE	612715	4	5	1	9	4	6
AMERICAN SPITFIRE	518434	5	5	1	10	6	7
AMERICAN TITAN	515976	5	5	1	10	6	7
AMERICAN TROJAN	517617	5	6	1	10	5	7
AMERICAN VETERAN	530142	5	6	1	9	6	5
ARGONAUT	601377	4	5	1	10	6	7
ASHLEY LYKES	292191	4	6	1	10	8	7
ATLANTIC SPIRIT	573223	5	5	1	8	6	5
AUSTRAL RAINBOW	530141	4	5	1	8	6	5
BAYAMON	530007	5	5	1	8	6	5
BORINQUEN	248239	5	5	1	8	9	5
CAGUAS	557149	5	5	1	8	6	5
CHARLOTTE LYKES	668349	4	6	1	8	5	5
CHEASPEAKE BAY	689194	4	4	1	6	3	3
CYGNUS	632750	4	4	1	6	3	4
DAWN	291781	4	5	1	9	8	5
DELAWARE BAY	689193	4	4	1	6	3	3
DOCK EXPRESS TEXAS	666669	4	3	0	3	0	1
ELIZABETH LYKES	500702	4	6	1	10	6	7
EXPORT CHAMPION	292669	4	6	1	11	8	8
EXPORT FREEDOM	541414	4	5	1	10	6	7
EXPORT PATRIOT	548442	4	5	1	10	6	7
FORTALEZA	544797	5	5	1	8	6	5
GALVESTON BAY	504077	4	5	1	8	5	4
GALVESTON BAY	665784	4	4	1	6	3	3
GENEVIEVE LYKES	513140	4	6	1	10	6	7
GREAT LAND	567835	4	5	0	9	6	5
GREEN BAY	907989	4	4	1	6	3	3
GREEN HARBOUR	561453	4	5	1	7	5	5
GREEN ISLAND	562594	4	5	1	7	5	5
GREEN LAKE	907990	4	4	1	6	3	3
GREEN VALLEY	559623	4	5	1	7	5	5
GREEN WAVE	677648	4	4	1	6	2	4

UNITED STATES FLAG DRY CARGO SHIPS - 1988 (CONTINUED)

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
HOWELL LYKES	509581	4	6	1	9	6	7
ISLAND MARIANA	627433	4	2	0	3	1	1
JAMES LYKES	280564	4	6	1	10	8	7
JEAN LYKES	287103	4	6	1	10	8	7
JOHN LYKES	282772	4	6	1	10	8	7
JOSEPH LYKES	281326	4	6	1	10	8	7
KAUAI	621042	4	6	1	10	7	7
LASH ATLANTICO	530145	4	5	1	9	4	3
LESLIE LYKES	287416	4	6	1	10	8	7
LETITIA LYKES	512187	4	6	1	10	6	7
LOUISE LYKES	299938	4	6	1	10	6	7
LURLINE	549900	4	5	1	9	7	6
LYRA	632749	5	5	1	8	5	5
MALLORY LYKES	297384	4	6	1	10	6	7
MANUKAI	524219	4	6	1	10	7	7
MANULANI	528400	4	6	1	10	7	7
MARGARET LYKES	668347	4	6	1	8	5	5
MARINE RELIANCE	695664	4	4	1	6	3	3
MARJORIE LYKES	289873	4	6	1	10	8	7
MASON LYKES	513860	4	6	1	9	6	7
MATSONIA	553090	4	5	1	9	7	6
MAUI	591709	4	6	1	10	7	7
MAUNALEI	246343	4	5	1	10	7	7
MERCURY	581745	4	4	1	9	7	5
NANCY LYKES	286650	4	6	1	10	8	7
NEDLLOYD HOLLAND	665222	4	4	1	6	3	3
NEDLLOYD HUDSON	665785	4	4	1	6	3	3
NEWARK BAY	665789	4	4	1	6	3	3
OVERSEAS JOYCE	921012	4	4	1	6	3	3
PONCE	512975	5	5	1	8	6	5
PRES. EISENHOWER	673003	4	4	1	6	3	3
PRES. F D ROOSEVELT	674310	4	4	1	6	3	3
PRES. WASHINGTON	653424	4	4	1	7	3	3
PRESIDENT ARTHUR	695901	4	4	1	6	3	3
PRESIDENT BUCHANAN	697633	4	4	1	6	3	3
PRESIDENT CLEVELAND	521866	4	6	1	11	7	10
PRESIDENT GARFIELD	905624	4	4	1	6	3	3
PRESIDENT GRANT	530138	4	6	1	10	7	6
PRESIDENT HARDING	909326	4	4	1	6	3	3
PRESIDENT HARRISON	530139	4	6	1	10	7	6
PRESIDENT HOOVER	530137	4	6	1	10	7	6
PRESIDENT JEFFERSON	544900	4	6	1	11	8	8
PRESIDENT JOHNSON	552109	4	6	1	11	8	8
PRESIDENT LINCOLN	651627	4	4	1	7	3	3
PRESIDENT MADISON	546725	4	6	1	11	8	8
PRESIDENT MONROE	655397	4	4	1	7	3	3
PRESIDENT PIERCE	552108	4	6	1	11	8	8
PRESIDENT TAFT	511653	4	5	1	10	7	7
PRESIDENT TAYLOR	518517	4	6	1	11	9	11
PRESIDENT TRUMAN	928562	4	4	1	6	3	3
PRESIDENT TYLER	530140	4	6	1	10	7	6
PRESIDENT WILSON	296779	4	6	1	11	8	8

UNITED STATES FLAG DRY CARGO SHIPS - 1988 (CONTINUED)

SHIP NAME	OFF. NUMBER	LICENSED			UNLICENSED		
		DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
PUERTO RICO	561732	5	5	1	8	6	5
RAINBOW HOPE	622178	4	2	0	3	1	1
RALEIGH BAY	665223	4	4	1	6	3	3
RESOLUTE	642140	4	4	1	6	3	1
ROBERT E LEE	557033	4	6	1	9	6	5
ROVER	519102	5	5	1	10	6	7
RUTH LYKES	502928	4	6	1	10	6	7
SAM HOUSTON	559035	4	6	1	9	6	5
SAN JUAN	516542	5	5	1	8	9	5
SANTA ADELA	504015	4	5	1	9	4	4
SANTA JUANA	502726	4	6	1	9	4	4
SEA FOX	679514	4	4	1	6	4	3
SEA LION	687321	4	4	1	6	4	3
SEA WOLF	676163	4	4	1	6	4	3
SEA-LAND ACHIEVER	665782	4	4	1	6	3	3
SEA-LAND ADVENTURER	594073	4	4	1	6	3	3
SEA-LAND ANCHORAGE	910306	4	4	1	6	3	3
SEA-LAND ATLANTIC	665786	4	4	1	6	3	3
SEA-LAND COMMITMENT	665788	4	4	1	6	3	3
SEA-LAND CONSUMER	552818	5	6	1	10	8	8
SEA-LAND CRUSADER	518444	4	6	1	6	6	3
SEA-LAND DEFENDER	604246	4	4	1	6	3	3
SEA-LAND DEVELOPER	604247	4	4	1	6	3	3
SEA-LAND DISCOVERY	516464	4	6	1	6	3	3
SEA-LAND ECONOMY	532410	5	6	1	10	8	8
SEA-LAND ENDURANCE	606062	4	4	1	6	3	3
SEA-LAND ENTERPRISE	623168	4	6	1	6	6	3
SEA-LAND EXPEDITION	544303	4	6	1	6	6	3
SEA-LAND EXPLORER	604248	4	4	1	6	3	3
SEA-LAND EXPRESS	604249	4	4	1	6	3	3
SEA-LAND FREEDOM	606065	4	4	1	6	3	3
SEA-LAND HAWAII	547288	4	6	1	6	6	3
SEA-LAND INDEPENDENCE	606061	4	4	1	6	3	3
SEA-LAND INNOVATOR	606064	4	4	1	6	3	3
SEA-LAND INTEGRITY	665783	4	4	1	6	3	3
SEA-LAND KODIAK	910308	4	4	1	6	3	3
SEA-LAND LEADER	594374	4	4	1	6	3	3
SEA-LAND LEGION	515155	4	6	1	6	6	3
SEA-LAND LIBERATOR	604245	4	4	1	6	3	3
SEA-LAND MARINER	606066	4	4	1	6	3	3
SEA-LAND NAVIGATOR	541868	4	6	1	6	6	3
SEA-LAND PACER	593980	4	4	1	6	3	3
SEA-LAND PACIFIC	612085	4	6	1	6	6	3
SEA-LAND PATRIOT	604244	4	4	1	6	3	3
SEA-LAND PERFORMANCE	665790	4	4	1	6	3	3
SEA-LAND PIONEER	594375	4	4	1	6	3	3
SEA-LAND PRODUCER	552819	5	6	1	10	8	8
SEA-LAND QUALITY	665787	4	4	1	6	3	3
SEA-LAND TACOMA	910307	4	4	1	6	3	3
SEA-LAND TRADER	552706	4	6	1	6	6	3
SEA-LAND VALUE	665781	4	4	1	6	3	3
SEA-LAND VENTURE	531478	5	6	1	10	8	8

UNITED STATES FLAG DRY CARGO SHIPS - 1988 (CONTINUED)

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
SEA-LAND VOYAGER	606063	4	4	1	6	3	3
SENATOR	639987	4	4	1	6	4	3
SHELDON LYKES	668350	4	6	1	8	5	5
STELLA LYKES	296216	4	6	1	10	6	7
STONEWALL JACKSON	557034	4	6	1	9	6	5
SUE LYKES	520392	4	6	1	10	6	7
TAMPA BAY	504982	4	5	1	8	5	4
THOMPSON LYKES	283413	4	6	1	10	7	9
WESTWARD VENTURE	581673	4	5	1	9	6	5
ZOELLA LYKES	282126	4	6	1	10	8	7
SUBTOTALS BY CATEGORY		677	810	159	1,292	840	799
TOTAL NUMBER OF BILLETS		4,577					
TOTAL NUMBER OF DRY CARGO SHIPS IN COMMERCIAL FLEET		163					

MARITIME PREPOSITIONING FORCE DRY CARGO SHIPS

1ST LT ALEX BONNYMAN	680897	4	5	1	6	3	6
1ST LT B LOPEZ	678108	4	4	1	8	5	8
1ST LT JACK LUMMUS	678109	4	4	1	8	5	8
2ND LT JOHN P BOBO	678106	4	4	1	8	5	8
CPL LOUIS J HAUGE	671969	4	5	1	6	3	7
MAJ STEPHEN W PLESS	655332	4	4	1	7	5	8
PFC DEWAYNE T WILLIAMS	678107	4	4	1	8	5	8
PFC EUGENE A OBREGON	641084	4	4	1	7	5	8
PFC JAMES ANDERSON	679513	4	5	1	6	3	6
PFC WILLIAM B BAUGH	674269	4	5	1	6	3	6
PVT HARRY FISHER	684591	4	5	1	6	3	6
SGT MATEJ KOCAK	641083	4	4	1	7	5	8
SGT WM R BUTTON	678110	4	4	1	8	5	8
SUBTOTALS BY CATEGORY		52	57	13	91	55	95
TOTAL NUMBER OF BILLETS		363					
TOTAL NUMBER OF DRY CARGO SHIPS IN MARITIME PREPOSITIONING FORCE		13					
GRAND TOTAL OF BILLETS ON DRY CARGO SHIPS BY CATEGORY		729	867	172	1,383	895	894
GRAND TOTAL OF BILLETS ON DRY CARGO SHIPS		4,940					
GRAND TOTAL OF DRY CARGO SHIPS		176					

UNITED STATES FLAG BULK AND PASSENGER SHIPS - 1988
(AS OF 1 JULY 1988)

BULK SHIPS

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
ALTAIR	694279	4	4	1	6	3	3
ARCHON	668167	4	4	1	6	3	3
ARION	694281	4	4	1	6	3	3
ASPEN	694280	4	4	1	6	3	3
AURORA	667028	4	4	1	6	3	3
BETTY WOOD	544994	2	2	0	3	0	1
CALRICE TRANSPORT	578241	4	4	0	6	3	2
ENERGY INDEPENDENCE	657540	4	4	1	8	3	3
EROL BEKER	646729	2	1	0	3	1	1
GOLDEN PHOENIX	598731	4	5	1	7	9	4
INGER	248011	4	4	1	8	2	4
JADE PHOENIX	598729	4	5	1	7	9	4
JAMIE A. BAXTER	583310	3	3	0	5	0	1
MARINE PRINCESS	652421	4	4	1	9	4	4
MOKO PAHU	649569	4	3	0	4	2	2
OMI MISSOURI	662123	4	4	1	6	3	3
OMI SACRAMENTO	662124	4	4	1	6	3	3
OVERSEAS HARRIETTE	590624	4	4	1	6	4	3
OVERSEAS MARILYN	590623	4	4	1	6	4	3
PRIDE OF TEXAS	634621	4	3	1	7	4	3
SEADRIFT	241851	4	4	1	6	3	2
SPIRIT OF TEXAS	635210	4	3	1	7	4	3
STAR OF TEXAS	642934	4	3	1	7	4	3
SUGAR ISLANDER	547000	4	4	1	6	3	3
ULTRAMAR	550200	4	4	1	9	4	4
ULTRASEA	555146	4	4	1	9	4	4
SUBTOTALS BY CATEGORY		99	96	21	165	88	75
TOTAL NUMBER OF BILLETS		544					
TOTAL NUMBER OF BULK SHIPS		26					

PASSENGER SHIPS (PEACETIME MANNING)

SHIP NAME	OFF. NUMBER	LICENSED DECK	LICENSED ENGINE	LICENSED RADIO	UNLICENSED DECK	UNLICENSED ENGINE	UNLICENSED STEWARD
CONSTITUTION *	262027	5	12	1	28	28	80
INDEPENDENCE *	261147	5	12	1	28	28	80
MONTEREY *	264687	8	11	4	35	28	54
UNITED STATES *	263934	8	12	1	35	28	80
SUBTOTALS BY CATEGORY		26	47	7	126	112	294
TOTAL NUMBER OF BILLETS ON PASSENGER SHIPS (PEACETIME MANNING)		612					
TOTAL NUMBER OF PASSENGER SHIPS		4					

UNITED STATES FLAG BULK AND PASSENGER SHIPS - 1988 (CONTINUED)

TROOPSHIPS (MOBILIZATION MANNING)

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
CONSTITUTION *	262027	5	12	1	28	28	20
INDEPENDENCE *	261147	5	12	1	28	28	20
MONTEREY *	264687	8	11	4	35	28	20
UNITED STATES *	263934	8	12	1	35	28	20
SUBTOTALS BY CATEGORY		26	47	7	126	112	80
TOTAL NUMBER OF BILLETS ON TROOPSHIPS (MOBILIZATION MANNING)		398					
TOTAL NUMBER OF TROOPSHIPS IN COMMERCIAL FLEET		4					
GRAND TOTAL OF BILLETS ON BULK AND PASSENGER SHIPS BY CATEGORY (PEACETIME MANNING)		125	143	28	291	200	369
GRAND TOTAL OF BILLETS ON BULK AND PASSENGER SHIPS (PEACETIME MANNING)		1,156					
GRAND TOTAL OF BULK AND PASSENGER SHIPS		30					
GRAND TOTAL OF BILLETS ON BULK AND TROOPSHIPS BY CATEGORY (MOBILIZATION MANNING)		125	143	28	291	200	155
GRAND TOTAL OF BILLETS ON BULK AND TROOPSHIPS (MOBILIZATION MANNING)		942					
GRAND TOTAL OF BULK AND TROOPSHIPS		30					

UNITED STATES FLAG TANKERS - 1988
(AS OF 1 JULY 1988)

SHIP NAME	OFF. NUMBER	LICENSED DECK	LICENSED ENGINE	LICENSED RADIO	UNLICENSED DECK	UNLICENSED ENGINE	UNLICENSED STEWARD
ADMIRALTY BAY	533270	5	5	1	9	5	4
ADONIS	653691	4	4	1	9	5	4
ALASKAN	512506	5	5	1	11	8	5
AMERICA SUN	523846	4	4	1	9	5	5
AMERICAN HERITAGE	577343	4	4	1	9	4	4
ARCO ALASKA	614544	4	4	1	9	5	4
ARCO ANCHORAGE	548424	4	4	1	9	5	4
ARCO CALIFORNIA	623291	4	4	1	9	5	4
ARCO FAIRBANKS	559400	4	4	1	9	5	4
ARCO INDEPENDENCE	586633	4	4	1	9	5	4
ARCO JUNEAU	556666	4	4	1	9	5	4
ARCO PRUDHOE BAY	536496	4	4	1	9	5	4
ARCO SAG RIVER	539313	4	4	1	9	5	4
ARCO SPIRIT	580245	4	4	1	9	5	4
ARCO TEXAS	549197	4	4	1	9	5	4
ARZEW	598727	5	6	1	10	6	6
ASPEN	535357	5	5	1	9	5	4
ATIGUN PASS	586128	4	4	1	9	4	4
B T ALASKA	590208	5	5	1	9	4	4
B T SAN DIEGO	598680	5	5	1	9	4	4
BALTIMORE TRADER	270179	4	4	1	9	5	4
BALTIMORE/BALTIMORE	654191	4	4	0	4	2	2
BAY RIDGE	600128	4	5	1	9	5	4
BEAVER STATE	572359	4	4	1	9	4	4
BLUE RIDGE	633428	4	4	1	7	2	3
BRAVADO	676454	4	3	0	3	0	1
BROOKLYN	553648	4	4	1	8	5	4
BROOKS RANGE	586130	4	5	1	9	5	4
CAROLE G INGRAM	538087	3	3	0	6	0	2
CHABLIS	283424	4	4	1	9	6	4
CHARLESTON	626561	4	4	1	9	2	4
CHELSEA	562416	4	4	1	8	4	4
CHEMICAL PIONEER	661060	5	5	1	8	5	4
CHERRY VALLEY	557503	4	4	1	8	4	4
CHESAPEAKE TRADER	650468	4	4	1	6	3	3
CHESTNUT HILL	577738	4	4	1	8	4	4
CHEVRON ARIZONA	588320	4	4	0	6	0	2
CHEVRON CALIFORNIA	541563	4	4	1	7	5	3
CHEVRON COLORADO	577358	4	4	0	6	0	2
CHEVRON LOUISIANA	584696	4	4	0	6	0	2
CHEVRON MISSISSIPPI	542850	4	4	1	7	5	3
CHEVRON OREGON	566080	4	4	0	6	0	2
CHEVRON WASHINGTON	570709	4	4	0	6	0	2
CHILBAR	634540	5	5	1	9	5	4
COAST RANGE	638709	4	4	1	6	3	3
COASTAL MANATEE	287186	4	4	1	9	5	3
COLORADO	245104	4	4	1	9	4	3
CONCHO	247640	4	4	1	9	4	3
COPPER MOUNTAIN	640448	4	5	1	9	6	4
CORNUCOPIA	590414	4	4	1	7	4	3
CORONADO	553623	4	4	1	8	4	4

UNITED STATES FLAG TANKERS - 1988 (CONTINUED)

	OFF.		LICENSED			UNLICENSED	
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
COURIER	578746	4	4	1	8	4	4
COVE LEADER	279938	4	5	1	7	5	4
COVE LIBERTY	644295	4	5	1	7	5	4
COVE TRADER	279438	4	5	1	7	5	4
DELAWARE TRADER	652547	4	4	1	6	3	3
EDGAR M QUEENY	528567	5	5	1	9	5	4
ENERGY ALTAIR	653464	2	1	0	2	1	1
ESTHER MORAN	292910	3	2	0	3	0	1
EXXON BALTIMORE	282272	4	5	1	6	4	4
EXXON BATON ROUGE	524619	4	4	1	6	3	3
EXXON BAYTOWN	658495	4	4	1	6	3	3
EXXON BENICIA	600478	4	4	1	6	4	3
EXXON BOSTON	283784	4	5	1	6	4	4
EXXON CHARLESTON	658493	5	4	1	6	4	3
EXXON GALVESTON	588443	4	3	0	6	2	3
EXXON HOUSTON	297151	4	4	1	6	5	3
EXXON JAMESTOWN	275519	4	5	1	6	4	4
EXXON LEXINGTON	276270	4	5	1	6	4	4
EXXON LONG BEACH	692967	4	4	1	6	3	3
EXXON NEW ORLEANS	298216	4	4	1	6	5	3
EXXON NORTH SLOPE	600477	4	4	1	6	4	3
EXXON PHILADELPHIA	526792	4	4	1	6	3	3
EXXON PRINCETON	647470	4	4	1	6	2	3
EXXON SAN FRANCISCO	523626	4	4	1	6	3	3
EXXON VALDEZ	692966	4	4	1	6	2	3
EXXON WASHINGTON	273896	4	5	1	6	4	4
EXXON WILMINGTON	658494	5	4	1	6	4	3
EXXON YORKTOWN	656742	4	4	1	6	2	3
FALCON CHAMPION	663105	4	3	1	8	3	3
FALCON COUNTESS	536850	4	4	1	7	4	3
FALCON DUCHESS	533611	4	4	1	8	3	3
FALCON LEADER	658555	4	3	1	8	3	3
FALCON PRINCESS	538811	4	4	1	8	3	3
FRANCIS HAMMER	638765	4	4	0	6	1	2
FREDRICKSBURG	277561	4	4	1	9	4	4
GAMMA	598730	5	6	1	10	6	6
GLACIER BAY	526588	5	5	1	9	5	4
GOLDEN ENDEAVOR	561433	4	4	1	9	4	4
GOLDEN GATE	526972	4	4	1	9	4	4
GOLDEN MONARCH	566090	4	4	1	9	4	4
GROTON/GROTON	647320	4	4	0	4	2	2
GUADALUPE	247350	4	4	1	9	4	3
GUS W DARNELL	684689	4	4	1	6	5	4
JACKSONVILLE/JACKSON	631787	4	4	0	4	2	2
JULIUS HAMMER/OXY	631332	4	4	0	6	1	2
KENAI	586127	4	4	1	9	4	4
KEYSTONE CANYON	586129	4	4	1	9	4	4
KEYSTONER	266730	4	4	1	9	5	4
KING	275193	4	4	1	6	6	3
KITTANNING	579572	4	4	1	8	4	4
KNIGHT	277183	4	4	1	6	6	3
LAWRENCE GIANELLA	684692	4	4	1	6	5	4

UNITED STATES FLAG TANKERS - 1988 (CONTINUED)

SHIP NAME	OFF. NUMBER	LICENSED DECK	ENGINE	RADIO	UNLICENSED DECK	ENGINE	STEWARD
LION OF CALIFORNIA	268216	4	4	0	9	3	4
LNG AQUARIUS	582506	5	6	1	10	4	5
LNG ARIES	588005	5	6	1	10	4	5
LNG CAPRICORN	588006	5	6	1	10	4	5
LNG GEMINI	595752	5	6	1	10	4	5
LNG LEO	595753	5	6	1	10	4	5
LNG LIBRA	595756	5	6	1	10	4	5
LNG TAURUS	595754	5	6	1	10	4	5
LNG VIRGO	595755	5	6	1	10	4	5
LOUISIANA BRIMSTONE	247757	4	5	1	10	9	5
MARINE CHEMIST	529399	5	5	1	10	6	4
MARINE DUVAL	245851	4	5	1	11	6	4
MARINE FLORIDIAN	246836	4	4	0	8	5	4
MARTHA R INGRAM	533104	3	3	0	6	0	2
MOBIL ARCTIC	542026	4	4	1	9	6	4
MOBIL MERIDIAN	286479	4	4	1	9	6	4
MOBILE/MOBILE	654193	4	4	0	4	2	2
MOBILE BAY	268798	4	4	1	9	8	5
MONTRACHET	279334	4	4	1	9	6	4
MORMACSKY	578288	4	4	1	8	4	4
MORMACSTAR	569257	4	4	1	8	4	4
MORMACSUN	573770	4	4	1	8	4	4
NECHES	277703	4	4	1	9	5	3
NEW YORK SUN	628783	4	4	1	6	3	4
NEW YORK/NEW YORK	648935	4	4	0	4	2	2
OCEAN CHALLENGER	569583	4	5	1	9	5	4
OCEAN RUNNER	564344	4	5	1	9	5	4
OCEAN WIZARD	574906	4	5	1	9	5	4
OMI CHAMPION	523341	4	4	1	6	5	4
OMI CHARGER	522864	4	4	1	6	5	4
OMI COLUMBIA	663428	4	4	1	6	4	4
OMI DYNACHEM	638899	4	4	1	6	4	3
OMI HUDSON	642151	4	4	1	6	4	3
OMI LEADER	520839	4	4	1	6	5	4
OMI WABASH	520728	4	4	1	6	5	4
OMI WILLIAMETTE	518738	4	4	1	6	5	4
OVERSEAS ALASKA	529795	4	4	1	6	6	3
OVERSEAS ALICE	514928	4	4	1	6	5	3
OVERSEAS ARCTIC	530877	4	4	1	6	6	3
OVERSEAS BOSTON	630050	4	5	1	6	6	3
OVERSEAS CHICAGO	583412	4	4	1	6	6	3
OVERSEAS JUNEAU	553137	4	4	1	6	6	3
OVERSEAS NATALIE	287156	4	4	1	6	6	3
OVERSEAS NEW YORK	588001	4	4	1	6	6	3
OVERSEAS OHIO	586647	4	4	1	6	6	3
OVERSEAS VALDEZ	517186	4	4	1	6	5	3
OVERSEAS VIVIAN	518125	4	4	1	6	5	3
OVERSEAS WASHINGTON	588955	4	4	1	6	6	3
PATRIOT	571049	4	4	1	8	4	4
PAUL BUCK	684688	4	4	1	6	5	4
PECOS	259357	4	4	1	9	4	3
PENNSYLVANIA TRADER	289972	4	4	1	9	4	4

UNITED STATES FLAG TANKERS - 1988 (CONTINUED)

SHIP NAME	OFF. NUMBER	LICENSED DECK	LICENSED ENGINE	LICENSED RADIO	UNLICENSED DECK	UNLICENSED ENGINE	UNLICENSED STEWARD
PHILADELPHIA/PHILA	654192	4	4	0	4	2	2
PHILADELPHIA SUN	638073	4	4	1	6	3	4
POMEROL	276911	4	4	1	9	6	4
POTOMAC TRADER	655201	4	4	1	6	3	3
PRINCE WILLIAM SOUND	570108	4	4	1	9	5	5
RANGER	573810	4	4	1	8	4	4
RICHARD G MATTHIESEN	684691	4	4	1	6	5	4
ROVER	577241	4	4	1	8	4	4
SABINE	274440	4	4	1	9	4	3
SAMUEL L COBB	684690	4	4	1	6	5	4
SANSINENA II	535020	4	4	1	7	6	4
SEA VENTURE	659954	4	4	1	6	3	2
SEABULK CHALLENGER	560289	4	4	0	6	0	2
SEABULK MAGNACHEM	580102	4	4	0	6	1	2
SEALIFT ANTARCTIC	557008	4	4	1	9	1	3
SEALIFT ARABIAN SEA	557001	4	4	1	9	1	3
SEALIFT ARCTIC	557007	4	4	1	9	1	3
SEALIFT ATLANTIC	557002	4	4	1	9	1	3
SEALIFT CARRIBEAN SEA	557006	4	4	1	9	1	3
SEALIFT CHINA SEA	557004	4	4	1	9	1	3
SEALIFT INDIAN OCEAN	557005	4	4	1	9	1	3
SEALIFT MEDITERRANEAN	557003	4	4	1	9	1	3
SEALIFT PACIFIC	557000	4	4	1	9	1	3
SIERRA MADRE	641804	4	4	1	6	3	3
SOLAR	280223	4	4	1	6	6	3
SOUTHERN	591902	5	6	1	10	6	6
SPRAY	282849	4	4	1	6	6	3
ST EMILION	272077	4	4	1	9	6	4
STUYVESANT	584459	4	5	1	9	5	4
SYOSSET	277623	4	4	1	6	6	4
TEXACO CALIFORNIA	266910	4	4	1	9	5	4
TEXACO CONNECTICUT	266501	4	4	1	9	5	4
TEXACO FLORIDA	271820	4	4	1	9	5	4
TEXACO GEORGIA	293819	4	4	1	9	5	4
TEXACO MASSACHUSETTS	290306	4	4	1	9	5	4
TEXACO MINNESOTA	243202	4	4	1	9	9	5
TEXACO MISSISSIPPI	245082	4	4	1	9	9	5
TEXACO MONTANA	298918	4	4	1	9	5	4
TEXACO NEW YORK	265981	4	4	1	9	5	4
TEXACO RHODE ISLAND	296380	4	4	1	9	5	4
TEXAS SUN	283897	4	4	1	9	5	5
THOMPSON PASS	586131	4	5	1	9	5	4
TONSINA	585629	4	4	1	9	4	4
TROPIC SUN	275583	4	4	1	9	5	5
U S T ATLANTIC	601437	4	5	1	9	5	5
U S T PACIFIC	613131	4	5	1	9	5	5
VALLEY FORGE	505786	4	5	1	9	5	4
WILLIAMSBURGH	560975	4	5	1	9	5	5

UNITED STATES FLAG TANKERS - 1988 (CONTINUED)

SHIP NAME	OFF. NUMBER	LICENSED			UNLICENSED		
		DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
GRAND TOTAL OF BILLETS ON TANKERS BY CATEGORY		830	856	180	1,551	834	730
GRAND TOTAL OF BILLETS ON TANKERS		4,981					
GRAND TOTAL OF TANKERS IN COMMERCIAL FLEET		203					

READY RESERVE FORCE SHIPS - 1988
(AS OF 1 JULY 1988)

READY RESERVE FORCE (RRF) DRY CARGO SHIPS

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
ADM. W. CALLAGHAN	511744	4	4	1	9	6	4
ADVENTURER	284024	4	4	1	9	6	4
AGENT	283936	4	4	1	9	6	4
AIDE	284516	4	4	1	9	6	5
AMBASSADOR	283150	4	4	1	9	6	4
AUSTRAL LIGHTNING	530144	4	4	1	9	5	5
BANNER	286124	4	4	1	9	6	4
BUYER*	288076	4	4	1	9	6	5
CALIFORNIA	287232	4	4	1	9	8	5
CAPE ALAVA	289281	4	4	1	9	6	4
CAPE ALEXANDER	289792	4	4	1	9	6	4
CAPE ANN	290143	4	4	1	9	6	5
CAPE ARCHWAY	290485	4	4	1	9	6	4
CAPE AVINOF	291026	4	4	1	9	6	5
CAPE BLANCO	505406	4	4	1	9	5	5
CAPE BON	509652	4	4	1	9	5	5
CAPE BORDA	507344	4	4	1	9	5	5
CAPE BOVER	506812	4	4	1	9	5	5
CAPE BRETON	508378	4	4	1	9	5	5
CAPE CANAVERAL	293817	4	4	1	9	6	5
CAPE CANSO	292614	4	4	1	9	6	4
CAPE CARTHAGE	293555	4	4	1	9	6	5
CAPE CATAWBA*	284285	4	4	1	9	6	5
CAPE CATOCHE	293220	4	4	1	9	6	5
CAPE CHALMERS	291609	4	4	1	9	6	5
CAPE CHARLES	292782	4	4	1	9	6	5
CAPE CLEAR	293224	4	4	1	9	6	5
CAPE COD	290508	4	4	1	9	6	5
CAPE DECISION	684098	4	5	1	11	5	6
CAPE DIAMOND	684097	4	5	1	11	5	6
CAPE DOMINGO	684099	4	5	1	11	5	6
CAPE DOUGLAS	684100	4	5	1	11	5	6
CAPE DUCATO	684101	4	4	1	9	5	4
CAPE EDMONT	901128	4	4	1	9	5	4
CAPE FAREWELL	549153	6	5	1	10	5	5
CAPE FLATTERY	550900	6	5	1	10	5	5
CAPE FLORIDA*	530143	4	4	1	9	5	4
CAPE GIBSON*	517717	4	4	1	9	6	6
CAPE GIRARDEAU*	517120	4	4	1	9	6	6
CAPE HENRY	901126	4	4	1	9	5	4
CAPE HORN	901125	4	4	1	9	5	4
CAPE HUDSON	901127	4	4	1	9	5	4
CAPE INSCRIPTION*	569400	4	4	1	9	5	4
CAPE ISABEL	577636	4	4	1	9	5	5
CAPE JOHNSON*	289547	4	4	1	9	6	5
CAPE LAMBERT	681926	4	5	1	8	5	4
CAPE LOBOS	694202	4	5	1	7	5	4
CAPE MAY	536671	4	4	1	9	5	4
CAPE MENDOCINO	536500	4	4	1	9	5	4

READY RESERVE FORCE SHIPS - 1988 (CONTINUED)

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
CAPE MOHICAN	536672	4	4	1	9	5	4
CAPE NOME*	522650	4	4	1	9	5	4
COMET		4	5	1	9	8	5
CORNHUSKER STATE*	520743	5	5	1	14	5	5
COURIER	289947	4	4	1	9	6	4
DEL MONTE	514758	4	4	1	9	8	5
DEL VALLE	516600	4	4	1	9	8	5
DEL VIENTO	517540	4	4	1	9	8	5
FLICKERTAIL STATE*	518063	5	5	1	14	5	5
GEM STATE*	501712	5	6	1	25	9	7
GOPHER STATE*	545126	5	5	1	14	5	5
GRAND CANYON STATE*	500484	5	6	1	25	9	7
GULF BANKER	295249	5	5	1	10	8	5
GULF FARMER	294625	5	5	1	10	8	5
GULF MERCHANT	297329	5	5	1	10	8	5
GULF SHIPPER	296880	5	5	1	10	8	5
GULF TRADER	296404	5	5	1	10	8	5
HATTIESBURG VICTORY*	248651	4	4	1	9	6	5
JUPITER	573093	4	4	1	9	5	5
KEYSTONE STATE*	502569	5	6	1	25	9	7
LAKE	284802	4	4	1	9	6	5
MAINE	504714	4	4	1	10	8	6
METEOR*		4	4	1	9	5	4
MISSION BUENAVENTURA*	516521	4	4	1	9	4	4
MISSION CAPISTRANO*	531154	4	4	1	8	3	3
NODAWAY*		4	4	1	9	3	3
NORTHERN LIGHT	286749	4	4	1	9	8	5
PATRIOT STATE*	293943	4	6	1	9	6	5
PIONEER COMMANDER	290905	4	4	1	9	8	5
PIONEER CONTRACTOR	291968	4	4	1	9	8	5
PIONEER CRUSADER	292930	4	4	1	9	8	5
POTOMAC	297163	4	4	1	10	5	6
PRIDE	282295	4	4	1	9	6	5
SANTA ANA	290262	4	4	1	9	6	5
SCAN	285890	4	4	1	9	6	5
SHOSHONE		4	4	1	9	6	5
SOUTHERN CROSS	287900	4	4	1	9	6	5
WASHINGTON	245460	4	4	1	10	8	6
SUBTOTALS BY CATEGORY		363	373	87	860	523	421
TOTAL NUMBER OF BILLETS		2,627					
TOTAL NUMBER OF DRY CARGO SHIPS IN RRF		87					

READY RESERVE FORCE SHIPS - 1988 (CONTINUED)

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
READY RESERVE FORCE (RRF) TANKERS							
ALATNA		4	4	1	9	3	3
AMERICAN EXPLORER		4	4	1	10	5	6
AMERICAN OSPREY	276034	4	4	1	10	5	6
CHATTAHOOCHEE		4	4	1	9	3	3
SUBTOTALS BY CATEGORY		16	16	4	38	16	18
TOTAL NUMBER OF BILLETS		108					
TOTAL NUMBER OF TANKERS IN RRF		4					
GRAND TOTAL OF BILLETS ON READY RESERVE FORCE (RRF) SHIPS BY CATEGORY		379	389	91	898	539	439
GRAND TOTAL OF BILLETS ON RRF SHIPS		2,735					
GRAND TOTAL OF RRF SHIPS		91					

MILITARY SEALIFT COMMAND (MSC)
REDUCED OPERATING STATUS (ROS) SHIPS - 1988

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
ALGOL	546383	4	5	1	10	11	11
ALTAIR	550722	4	5	1	10	11	11
ANTARES	542200	4	5	1	10	11	11
BELLATRIX	545201	4	5	1	10	11	11
CAPELLA	540413	4	5	1	10	11	11
DENEBOLA	550723	4	5	1	10	11	11
POLLUX	550721	4	5	1	10	11	11
REGULUS	545200	4	5	1	10	11	11
CURTISS (T-AVB)	521302	4	4	1	9	4	4
WRIGHT (T-AVB)	524416	4	4	1	9	4	4
GRAND TOTAL OF BILLETS BY CATEGORY		40	48	10	98	96	96
GRAND TOTAL OF BILLETS		388					
GRAND TOTAL OF SHIPS		10					

NATIONAL DEFENSE RESERVE FLEET SHIPS - 1988
(AS OF 1 JULY 1988)

SHIP NAME	OFF. NUMBER	LICENSED DECK	LICENSED ENGINE	RADIO	UNLICENSED DECK	UNLICENSED ENGINE	UNLICENSED STEWARD
ADELPHI VICTORY*	248091	5	6	1	12	10	10
ALBION VICTORY*	247130	5	6	1	12	10	10
ALLEGHENY VICTORY*	248163	5	6	1	12	10	10
AMARILLO VICTORY*	248325	5	6	1	12	10	10
AMERICAN ALTAIR	298129	5	6	1	11	7	8
AMERICAN BANKER	288986	4	5	1	7	6	5
AMERICAN DRACO	299008	5	6	1	11	7	8
AMERICAN RACER	297001	5	6	1	11	8	8
AMERICAN RANGER	298270	5	6	1	11	8	8
AMERICAN RELIANCE	299371	5	6	1	11	8	8
AMERICAN VICTORY	248005	5	5	1	13	8	7
ANCHORAGE VICTORY*	247071	5	6	1	12	10	10
ASBURY VICTORY*	248202	5	6	1	12	10	10
BARNARD VICTORY*	247659	5	6	1	12	10	10
BARRE VICTORY*	248430	5	6	1	12	10	10
BATTLE CREEK VICTORY	248432	5	6	1	12	10	10
BAY	286965	5	6	1	11	9	10
BEATRICE VICTORY*	247131	5	6	1	12	10	10
BEAUJOLAIS	267190	4	4	1	9	6	4
BELGIUM VICTORY*	245445	5	6	1	12	10	10
BENJAMIN HARRISON	624457	5	6	1	9	6	5
BEREA VICTORY*	247508	5	6	1	12	10	10
BERKELEY VICTORY*	247143	5	6	1	12	10	10
BESSEMER VICTORY*	248503	5	6	1	12	10	10
BRAZIL VICTORY*	245618	5	6	1	12	10	10
BRAZOS*		5	5	1	12	11	9
BRINTON LYKES	288699	5	6	1	10	8	7
BUCKNELL VICTORY*	247382	5	6	1	12	10	10
BUILDER	287381	5	6	1	11	9	10
CANTON VICTORY*	248205	5	6	1	12	10	10
CAPE GASPE	297353	5	6	1	11	7	8
CAPE GEORGIA	500539	5	6	1	11	7	8
CAPE JOHN	288603	5	8	1	11	9	10
CAPE JUBY	289119	5	8	1	11	9	10
CAPE JUNCTION	287875	5	8	1	11	9	10
CARROLL VICTORY*	246168	5	6	1	12	10	10
CATAWBA VICTORY	248116	5	5	1	12	10	10
CCNY VICTORY*	248049	5	6	1	12	10	10
CENTRAL VICTORY*	247528	5	6	1	12	10	10
CHANCELLORSVILLE	244235	5	5	1	12	11	9
CHEASAPEAKE	296863	4	4	1	9	10	4
CITADEL VICTORY*	247489	5	6	1	12	10	10
CLARKSVILLE VICTORY*	247211	5	6	1	12	10	10
COMMERCE	291731	5	6	1	11	9	9
CONNECTICUT	277291	5	5	1	12	9	9
CORNELL VICTORY*	247641	5	6	1	12	10	10
COUNCIL BLUFFS VICTOR*	248841	5	6	1	12	10	10
CRACKER STATE MARINER	267733	5	6	1	11	9	10
DE PAUW VICTORY*	247383	5	6	1	12	10	10
DIAMOND STATE	287976	5	6	1	12	9	9
DRAKE VICTORY*	248010	5	6	1	12	10	10

NATIONAL DEFENSE RESERVE FLEET SHIPS - 1988 (CONTINUED)

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
DUKE VICTORY	247439	5	5	1	12	10	10
DURANGO VICTORY*	247096	5	6	1	12	10	10
EARLHAM VICTORY*	248166	5	6	1	12	10	10
EDWARD RUTLEDGE	625873	5	6	1	9	6	5
ELKO VICTORY*	247075	5	6	1	12	10	10
ELMIRA VICTORY*	245770	5	6	1	12	10	10
ENID VICTORY*	248283	5	6	1	12	10	10
EQUALITY STATE	287238	5	6	1	7	6	5
EXPORT CHALLENGER	292227	4	6	1	11	8	8
EXXON GETTYSBURG	273362	4	5	1	6	4	4
FLORENCE	266855	4	4	1	11	13	6
GAINESVILLE VICTORY*	246139	5	6	1	12	10	10
GEN S B BUCKNER*		6	12	2	33	29	20
GEN A M PATCH*		6	12	2	33	29	20
GEN E PATRICK*		6	12	2	33	29	20
GEN JOHN POPE*		6	12	2	33	29	20
GEN M ROSE*		6	12	2	33	29	20
GLEN	285283	5	7	1	11	9	10
GROVE CITY VICTORY*	247853	5	6	1	12	10	10
HALAULA VICTORY*	247217	5	6	1	12	10	10
HAMILTON VICTORY*	248167	5	6	1	12	10	10
HANNIBAL VICTORY*	247116	5	6	1	12	10	10
HARVARD VICTORY*	247334	5	6	1	12	10	10
HIGH POINT VICTORY*	248652	5	6	1	12	10	10
HOBART VICTORY*	248012	5	6	1	12	10	10
HOPE VICTORY*	247900	5	6	1	12	10	10
JOHN HENRY	599294	4	2	1	6	1	2
JOPLIN VICTORY*	245749	5	6	1	12	10	10
LAHAINA VICTORY*	247273	5	6	1	12	10	10
LAKEWOOD VICTORY*	249821	5	6	1	12	10	10
LANE VICTORY*	248094	5	6	1	12	10	10
LAS VEGAS VICTORY*	246657	5	6	1	12	10	10
LINCOLN	285311	5	8	1	13	12	12
LINDENWOOD HAVEN VICT*	248278	5	6	1	12	10	10
LOYOLA VICTORY*	247595	5	6	1	12	10	10
LYNN VICTORY*	248436	5	6	1	12	10	10
MALDEN VICTORY*	246763	5	6	1	12	10	10
MANDERSON VICTORY*	246676	5	6	1	12	10	10
MASSILLON VICTORY*	247097	5	6	1	12	10	10
MAUMEE*		4	4	1	11	4	4
MAYFIELD VICTORY	246775	5	6	1	14	11	10
MEACHEM	274588	4	4	1	10	6	7
MEREDITH VICTORY*	248209	5	6	1	12	10	10
MIRFAK*		5	5	1	12	11	9
MISSION SAN YNEZ*		5	5	1	12	11	9
MOUNT VERNON VICTORY	284178	5	5	1	10	6	5
MOUNT WASHINGTON	293097	4	5	1	10	6	6
MUHLENBERG VICTORY*	248300	5	6	1	12	10	10
NAECO	274966	4	4	1	11	13	6
NEWCASTLE VICTORY*	250029	5	6	1	12	10	10
OCALA VICTORY*	247034	5	6	1	12	10	10
OCCIDENTAL VICTORY*	247764	5	6	1	12	10	10

NATIONAL DEFENSE RESERVE FLEET SHIPS - 1988 (CONTINUED)

	OFF.	LICENSED			UNLICENSED		
SHIP NAME	NUMBER	DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD
OHIO	244610	4	4	1	13	11	8
OSHKOSH VICTORY*	248509	5	6	1	12	10	10
PACIFIC VICTORY*	248332	5	6	1	12	10	10
PAN AMERICAN VICTORY*	247791	5	6	1	12	10	10
PAUL BUNYON	602272	4	2	1	6	1	2
PETERSBURG	291990	4	4	1	9	5	4
PINE BLUFF VICTORY*	248333	5	6	1	12	10	10
PRESIDENT	286232	5	8	1	13	12	12
PRIDE II	279769	4	4	1	6	6	3
PRINCETON VICTORY*	247444	5	6	1	12	10	10
PURDUE VICTORY*	247618	5	6	1	12	10	10
QUEENS VICTORY*	247952	5	6	1	12	10	10
RED OAK VICTORY*	249410	5	6	1	12	10	10
RIDER VICTORY*	247646	5	6	1	12	10	10
SAGAMORE	278320	4	4	1	7	2	3
SAN MATEO VICTORY*	248286	5	6	1	12	10	10
SANTA BARBARA	509186	5	6	1	11	8	8
SANTA CLARA	506249	5	6	1	11	8	8
SANTA CRUZ	504681	5	6	1	11	8	8
SANTA ELENA	507696	5	6	1	11	8	8
SANTA ISABEL	510570	5	6	1	11	8	8
SANTA LUCIA	502774	5	6	1	11	8	8
SAUGATUCK*		5	5	1	12	11	9
SELMA VICTORY*	246142	5	6	1	12	10	10
SHIRLEY LYKES	289283	5	6	1	10	8	7
SIOUX FALLS VICTORY*	247619	5	6	1	12	10	10
SOLON TURMAN	285889	5	7	1	11	9	9
SOUTHWESTERN VICTORY*	247871	5	6	1	12	10	10
ST AUGUSTINE VICTORY*	248438	5	6	1	12	10	10
TEXACO MARYLAND	292735	4	4	1	11	8	6
TUCSON VICTORY*	248410	5	6	1	12	10	10
TULANE VICTORY*	247651	5	6	1	12	10	10
VANDERBILT VICTORY*	247691	5	6	1	12	10	10
WAYNE VICTORY*	248021	5	6	1	12	10	10
WHITTIER VICTORY*	248214	5	6	1	12	10	10
WINTHROP VICTORY*	247957	5	6	1	12	10	10
YUKON*		4	4	1	11	4	4
GRAND TOTAL OF BILLETS ON NDRF SHIPS BY CATEGORY		687	837	145	1,699	1,376	1,296
GRAND TOTAL OF BILLETS		6,040					
GRAND TOTAL OF SHIPS		140					

APPENDIX D

UNITED STATES SHIPBUILDING AND SHIP REPAIR INDUSTRY

APPENDIX D-1

OPEN SHIPYARDS, SHIP REPAIR FACILITIES, AND BOAT YARDS DATA BASE

A complete listing of the key facilities and employment history for each active United States shipbuilding firm, ship repair firm, and boat yard was required in order for the Commission accurately to assess the capability of the shipbuilding and ship repair industry. No single, complete source of data for active shipyards and ship repair company facilities and manpower existed. Several government and private agencies, including the Naval Sea Systems Command (NAVSEA), the Maritime Administration (MARAD), the Military Sealift Command (MSC), the Army Corps of Engineers, the Shipbuilders Council of America (SCA), and the American Waterways Shipyard Conference (AWSC), maintained records of some existing shipyards and ship repair facilities for their own use. Their data was collected and collated by the Commission, and a data base was created. The data base was then verified and expanded by the Commission staff, which was in contact with each of the firms listed.

The data base includes all active public and private shipyards, ship repair facilities, and boat yards contained in any of the following categories: MARAD listing of United States shipbuilding and repair facilities, NAVSEA bidders mailing list, NAVSEA Master Ship Repair Contractors, MARAD Master Lump Sum Repair Contractors, MSC Master Ship Repair Contractors, member firms or firms reporting statistics to the SCA, member firms or firms reporting statistics to the AWSC, and the lists of ship and boat repair facilities maintained by the various districts of the United States Army Corps of Engineers.

The data base does not include firms dealing solely in the pleasure boat industry or those firms that are primarily ship operators but that maintain a repair capability solely for their own fleets.

The data fields listed are defined as follows:

a. **NAME:** This data field contains the company name and complete mailing address. An asterik (*) indicates that all facilities are not centralized at one location, but are located in close physical proximity and operationally managed as a single shipyard facility.

b. **C / A:** Designation by the Commission as a core or ancillary mobilization shipyard. A core mobilization shipyard is defined as one that has building positions and/or docking positions capable of accommodating a vessel 400 feet long and 68 feet in beam, and a minimum channel water depth of 12 feet. An ancillary mobilization shipyard is defined as one with the capability to berth and repair vessels over 400 feet in length and having a draft of 12 feet or less. The latter firms can accomplish only certain mobilization tasks, such as activations of Ready Reserve Force ships.

c. **PERSONNEL:** The three columns indicate the approximate number of production workers employed by the shipyard during each of the time periods specified. Production workers are defined as those personnel charged as direct labor to a particular job, including skilled, semiskilled and unskilled workers; direct project engineers; first-line supervisors; and quality control inspectors.

Max 82-88: The maximum number of production workers employed during the period from January 1982 to January 1988.

Oct '82: The number of production workers employed during the month of October 1982.

Jan '88 (Aprx): The approximate number of production workers employed on or about January 1988.

d. **FACILITIES:** The four columns indicate data about the key facilities for each shipyard:

Build Pos: A single letter indicating the type of building position available. The numerals following it indicate the maximum length of vessel (in feet) that could be constructed at that position; a hyphen and a number following the basic entry indicate multiple building positions of the same length. When a graving dock or marine railway is used for both construction and repair, it is categorized by its most common use. Building positions with a maximum length under 100 feet are not included.

G - Graving drydock
W - Building way
M - Marine railway
L - Land level position

Dock Pos: A single letter indicating the type of drydocking capability available. The numerals following it indicate the maximum length of vessel (in feet) that could be accommodated by the drydock; a hyphen and a number following the basic entry indicate multiple drydocks of the same length. Drydocks less than under 100 feet in length are not included.

G - Graving drydock
F - Floating drydock
M - Marine railway
S - Synchro-lift
L - Land level position

L-Pier / T-Pier: The first number indicates the length (in feet) of the longest usable pier available in the shipyard. The second number indicates the cumulative total of the usable pier length available (in feet).

Chan / Berth: The first number indicates the minimum water depth (in feet) of the channel serving the shipyard. The second number indicates the minimum water depth (in feet) at the deepest berth in the shipyard.

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
A & E Industries, Inc.	–	200	76	60	NONE	NONE	NONE	N/A
P.O. Box 792					–	–	–	N/A
National City, CA 92050					–	–		
					–	–		
					–	–		
					–	–		
Acme Repair Co., Inc.	–	30	0	20	NONE	NONE	NONE	N/A
346 Front Street					–	–	–	N/A
Staten Island, NY 10304					–	–		
					–	–		
					–	–		
					–	–		
ADDSCO Industries, Inc.	C	1001	19	700	W620	F620	1125	40
P.O. Box 190					W523	–	9370	28
Mobile, AL 36601					W523	–		
					W523	–		
					W523	–		
					–	–		
Advance Boiler & Tank Company	–	40	31	40	NONE	NONE	NONE	N/A
1711 South Carferry Drive					–	–	–	N/A
Milwaukee, WI 53207					–	–		
					–	–		
					–	–		
					–	–		
Advex Corporation	–	110	110	80	NONE	NONE	NONE	N/A
121 Floyd Thompson Drive					–	–	–	N/A
Hampton, VA 23666-1307					–	–		
					–	–		
					–	–		
					–	–		
AK-WA Company	C	400	0	300	L450	F526	1200	40
P.O. Box 872					W450	–	1700	40
Tacoma, WA 98401					–	–		
					–	–		
					–	–		
					–	–		
Al Larson Boat Shop	A	200	107	80	W200	F230	475	22
1046 South Seaside Avenue					W130	F220	650	32
Los Angeles, CA 90731					W120	–		
					W110	–		
					–	–		
					–	–		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Alco Welding & Machine Co.	-	40	40	30	NONE	NONE	NONE	N/A
236 W. 25th Street					-	-	-	N/A
Norfolk, VA 23523					-	-		
					-	-		
					-	-		
					-	-		
Algiers Iron Works & DD Co.	-	100	91	40	NONE	F256	276	40
P.O. Box 6068					-	F200	276	20
New Orleans, LA 70074					-	-		
					-	-		
					-	-		
					-	-		
Allied Shipyard, Inc.	-	50	50	10	W125	F125	150	12
P.O. Box 338					-	F125	500	20
Larose, LA 70373					-	F125		
					-	M400		
					-	-		
					-	-		
American Marine Corporation	-	400	400	225	W400	F200	350	30
P.O. Box 8126					W350	-	3430	20
New Orleans, LA 70182					-	-		
					-	-		
					-	-		
					-	-		
American Shipbuilding & Design	-	9	9	10	NONE	NONE	NONE	N/A
P.O. Box 350641 Riverside Sta.					-	-	-	N/A
Miami, FL 33135					-	-		
					-	-		
					-	-		
					-	-		
AMT Incorporated	-	50	20	30	NONE	NONE	5000	24
2400 N.W. 39th Avenue					-	-	7200	35
Miami, FL 33142					-	-		
					-	-		
					-	-		
					-	-		
Anacostia Marina, Inc.	-	18	18	10	NONE	M100	160	9
1900 'M' Street S.E.					-	-	1500	7
Washington, DC 20003					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Anderson & Cristofani P.O. Box 24609 San Francisco, CA 94124	-	12	10	10	M125 - - - - -	M120 - - - - -	120 120	20 20
Associated Naval Architects 3400 Shipwright Street Portsmouth, VA 23703	A	120	100	90	NONE - - - - -	M200 M130 M120 M120 - -	400 1550	20 20
Astoria Marine Construction Co 403 S.W. Front Street Astoria, OR 97103	-	22	22	20	M200 - - - - -	M120 - - - - -	360 700	10 12
ATCO Marine Corporation 603 Dean Street Brooklyn, NY 11238	-	25	20	10	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Atlantic B. C., Inc. 145 Van Dyke Street Brooklyn, NY 11231	-	95	53	10	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Atlantic Dry Dock Corp. 8503 McKenna Road Jacksonville, FL 32226	C	450	86	350	NONE - - - - -	M450 M250 - - - -	750 1800	32 30
Atlantic Marine, Inc. P.O. Box 138 Fort George Island, FL 32226	-	370	213	175	W250 W110 - - - -	NONE - - - - -	180 360	12 16

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Atlantic Yacht Corp.	-	85	30	70	L100	S100	350	12
P.O. Box 1318					-	-	350	12
Palatka, FL 32078-1318					-	-		
					-	-		
					-	-		
					-	-		
Automated Marine Prop Sys, Inc	-	55	25	30	NONE	NONE	AVAIL	N/A
240 E. Barbours Cut Blvd.					-	-	-	N/A
La Porte, TX 77571					-	-		
					-	-		
					-	-		
					-	-		
Avondale Industries, Inc.	C	6300	4392	4500	W1020	F1000	2300	40
P.O. Box 50280					W1020	F750	5405	20
New Orleans, LA 70150					W1020	F380		
					W700-5	-		
					W450	-		
					W450	-		
Avondale Industries, Inc.	-	80	0	80	NONE	NONE	NONE	N/A
P.O. Box 2249					-	-	-	N/A
Gulfport, MS 39505					-	-		
					-	-		
					-	-		
					-	-		
Azalea Fleet, Inc.	-	80	80	30	NONE	L200	NONE	N/A
P.O. Box 537					-	-	-	N/A
Ama, LA 70031					-	-		
					-	-		
					-	-		
					-	-		
B & A Marine Company, Inc.	-	150	90	80	NONE	NONE	NONE	N/A
75 Huntington Street					-	-	-	N/A
Brooklyn, NY 11231					-	-		
					-	-		
					-	-		
					-	-		
B & M Marine Repairs, Inc.	-	60	0	50	NONE	NONE	NONE	N/A
2405 Air Park Road					-	-	-	N/A
N. Charleston, SC 29418					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
B & M Marine Repairs, Inc.	-	52	0	40	NONE	NONE	NONE	N/A
313 S. Main Street					-	-	-	N/A
Norfolk, VA 23523					-	-		
					-	-		
					-	-		
					-	-		
Baker Marine Corporation	-	1200	1100	10	M400	NONE	550	20
P.O. Box 190					-	-	775	20
Ingleside, TX 78362					-	-		
					-	-		
					-	-		
					-	-		
Balehi Marine, Inc.	-	200	70	40	W180	NONE	200	10
P.O. Box 600					W130	-	600	10
Lacombe, LA 70445					W120	-		
					-	-		
					-	-		
					-	-		
Banks Rigging Corporation	-	49	39	40	NONE	NONE	NONE	N/A
1120 West Olney Road					-	-	-	N/A
Norfolk, VA 23507					-	-		
					-	-		
					-	-		
					-	-		
Barbour Boat Works, Inc.	-	100	53	80	W170	M200	400	14
P.O. Box 1069					W170	M140	1000	13
New Bern, NC 28560					W170	-		
					-	-		
					-	-		
					-	-		
Bath Iron Works Corp. *	C	6500	6000	6500	W700	F1000	900	43
700 Washington Street					W700	F550	3006	38
Bath, ME 04530					W650	-		
					-	-		
					-	-		
					-	-		
Bay City Marine	-	270	88	125	M140	NONE	292	17
3040 Terminal Avenue					-	-	700	16
National City, CA 92050					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-86	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Bay Shipbuilding Corporation	C	1580	1280	20	V730	G1000	1000	22
605 North Third Avenue					-	F640	5700	17
Sturgeon Bay, WI 54235					-	G180		
					-	-		
					-	-		
					-	-		
Bender Shipbuilding & Repair	C	640	640	350	W250	F660	845	25
P.O. Box 42					W250	F414	2900	42
Mobile, AL 36601					W200	F414		
					W200	M160		
					W130	-		
					W130	-		
Berwick Shipyard	-	35	30	10	NONE	F240	200	20
P.O. Box 168					-	F115	400	12
Berwick, LA 70342					-	-		
					-	-		
					-	-		
					-	-		
Best Repair Company	-	100	60	40	NONE	NONE	NONE	N/A
P.O. Box 11107					-	-	-	N/A
Norfolk, VA 23517					-	-		
					-	-		
					-	-		
					-	-		
Bethlehem Steel Corp. Beaumont	C	1546	344	570	W970	NONE	1000	40
P.O. Box 3031					W400	-	4500	35
Beaumont, TX 77704					-	-		
					-	-		
					-	-		
					-	-		
Bethlehem Steel Corp. Sabine	C	243	0	50	NONE	F950	NONE	40
P.O. Box 1448					-	-	-	N/A
Port Arthur, TX 77641					-	-		
					-	-		
					-	-		
					-	-		
Bethlehem Steel Corp. Sparrows	C	2318	480	1450	W800	G1200	1260	30
Baltimore Marine Division					W800	F950	3970	30
Sparrows Point, MD 21219					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Billfish, Inc.	A	81	29	50	V150	F210	620	37
Berth 44, Outer Harbor					V110	-	620	38
San Pedro, CA 90731					-	-		
					-	-		
					-	-		
					-	-		
Blount Marine Corporation	-	130	120	100	V250	NONE	400	20
461 Water Street					-	-	450	10
Warren, RI 02885					-	-		
					-	-		
					-	-		
					-	-		
Bludworth Bond Shipyard, Inc.	A	890	180	300	NONE	F300	450	30
P.O. Box 5065					-	F245	1500	22
Houston, TX 77262					-	F220		
					-	F210		
					-	-		
					-	-		
Boland Marine & Mfg. Co.	A	1250	320	60	NONE	NONE	800	36
P.O. Box 53287					-	-	800	26
New Orleans, LA 70153					-	-		
					-	-		
					-	-		
					-	-		
Bollinger Mach. Shop & Shipyd.	A	520	350	500	V300	F300	5400	15
P.O. Box 250					V165	F205	11900	12
Lockport, LA 70374					V120	F180		
					V120	-		
					-	-		
					-	-		
Boston Graving Dock, Corp.	C	50	0	20	NONE	F690	1000	34
256 Marginal Street					-	G250	2200	30
East Boston, MA 02128					-	-		
					-	-		
					-	-		
					-	-		
Boston Marine Industrial Park	C	20	20	20	NONE	G1150	910	35
10 Drydock Avenue					-	-	1600	35
Boston, MA 02210					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Boston Whaler, Inc.	-	583	260	600	NONE	NONE	NONE	N/A
1149 Hingham Street					-	-	-	N/A
Rockland, MA 02370					-	-		
					-	-		
					-	-		
					-	-		
Bourg Drydock & Service Co.	-	65	40	50	W220	F220	2000	10
P.O. Box 1852					L220	M220	2300	8
Houma, LA 70361					-	-		
					-	-		
					-	-		
					-	-		
Brady Marine Repair, Inc.	-	60	60	30	NONE	NONE	NONE	N/A
399-419 Trumbull Street					-	-	-	N/A
Elizabeth, NJ 07206					-	-		
					-	-		
					-	-		
					-	-		
Braswell Shipyards, Inc.	A	444	171	150	NONE	F200	600	35
3 Braswell Street					-	-	900	21
Charleston, SC 29405					-	-		
					-	-		
					-	-		
					-	-		
Broward Marine, Inc.	-	200	130	175	W145	M130	110	10
1601 S.W. 20th Street					-	-	1000	10
Fort Lauderdale, FL 33315					-	-		
					-	-		
					-	-		
					-	-		
Buck Kreihs Company	A	350	180	90	NONE	NONE	1120	40
P.O. Box 53305					-	-	1120	30
New Orleans, LA 70153-3305					-	-		
					-	-		
					-	-		
					-	-		
Burger Boat Company, Inc.	-	250	140	200	W150	NONE	150	17
P.O. Box 7					W150	-	450	17
Manitowoc, WI 54220					W150	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
C & C Marine Maintenance Co.	-	40	15	40	NONE	F200	400	10
P.O. Box 118					-	M250	400	8
Georgetown, PA 15043					-	-		
					-	-		
					-	-		
					-	-		
Caddell Dry Dock & Repair Co.	C	200	160	150	NONE	F450	820	35
P.O. Box 327					-	F330	1900	20
Staten Island, NY 10310					-	F261		
					-	F256		
					-	F181		
					-	F177		
Campbell Industries	A	268	150	70	W252	F389	640	35
501 E. Harbor Drive					W234	F200	2185	25
San Diego, CA 92112					W128	F200		
					-	F140		
					-	-		
					-	-		
Carotex, Inc.	-	80	80	30	W190	NONE	300	15
110 Yacht Club Road					-	-	800	12
Port Arthur, TX 77640					-	-		
					-	-		
					-	-		
					-	-		
Cascade General, Inc.	C	750	0	150	AVAIL	AVAIL	AVAIL	N/A
P.O. Box 4367					-	-	-	N/A
Portland, OR 97208					-	-		
					-	-		
					-	-		
					-	-		
Channel Shipyard Co., Inc.	-	45	0	50	NONE	NONE	450	22
P.O. Box 926					-	-	1550	10
Highlands, TX 77562					-	-		
					-	-		
					-	-		
					-	-		
Charles Lowe Company	-	135	68	40	NONE	NONE	NONE	N/A
1400 Park Avenue					-	-	-	N/A
Emeryville, CA 94608					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Charleston Naval Shipyard Naval Base Charleston, SC 29408	C	4724	4389	4200	NONE - - - - -	G741 G607 G580 F400 - -	1260 11700	35 37
Chesapeake Shipbuilding, Inc. 710 Fitzwater Street Salisbury, MD 21801	-	110	100	30	L300 - - - - -	NONE - - - - -	400 1100	12 12
Classon Industries 42 Commerce Street Brooklyn, NY 11231	-	35	20	20	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Coastal Iron Works, Inc. P.O. Box 2548 Corpus Christi, TX 78403	A	160	100	90	NONE - - - - -	F200 M150 - - - -	487 487	30 16
Coastal Marine Serv. of Texas 1051 Houston Avenue Port Arthur, TX 77640	A	350	150	100	NONE - - - - -	NONE - - - - -	840 1440	25 25
Colberg, Inc. P.O. Box 1288 Stockton, CA 95201	-	120	12	10	W170 - - - - -	M120 M120 - - - -	110 280	26 23
Colonna's Shipyard, Inc. 400 E. Indian River Road Norfolk, VA 23523	C	750	205	500	NONE - - - - -	F720 M430 M400 M230 - -	900 2480	30 32

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Commercial Marine Service, Inc	A	30	6	20	W225	M210	420	22
258 Cannery Street					W110	M110	1080	25
Terminal Island, CA 90731					-	-		
					-	-		
					-	-		
					-	-		
Continental Maritime San Diego	A	507	73	400	NONE	NONE	650	41
1995 Bay Street					-	-	3977	40
San Diego, CA 92113					-	-		
					-	-		
					-	-		
					-	-		
Continental Maritime San Fran.	C	620	231	450	NONE	F750	1100	36
Pier 50-54					-	-	3139	31
San Francisco, CA 94107					-	-		
					-	-		
					-	-		
					-	-		
Crumpler's Machine & Weld Svcs.	-	45	15	30	NONE	F150	230	20
P.O. Drawer 848					-	-	800	10
Bridge City, TX 77611					-	-		
					-	-		
					-	-		
					-	-		
D. N. Kelley & Son, Inc.	-	80	50	50	M140	M140	150	20
32 Water Street					-	M110	700	12
Fairhaven, MA 02719					-	-		
					-	-		
					-	-		
					-	-		
Darby Marine & Supply, Inc.	-	53	20	50	NONE	M100	168	8
P.O. Box 188					-	-	352	6
Mt. Pleasant, SC 29464					-	-		
					-	-		
					-	-		
					-	-		
Davis Boat Works, Inc.	-	120	28	100	NONE	S140	780	12
99 Jefferson Avenue					-	-	780	12
Newport News, VA 23607					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Delta Marine Industries, Inc.	-	204	204	150	L120-5	NONE	300	15
1608 South 96th Street					-	-	600	10
Seattle, WA 98108					-	-		
					-	-		
					-	-		
					-	-		
Delta Marine, Inc.	A	70	0	50	NONE	F120	900	30
P.O. Box 2191					-	F180	1650	21
Wilmington, NC 28402					-	-		
					-	-		
					-	-		
					-	-		
Detyens Shipyards, Inc.	C	440	426	325	NONE	F500	510	18
Route #2, Box 180					-	F290	1190	26
Mt. Pleasant, SC 29464					-	-		
					-	-		
					-	-		
					-	-		
Diamond Manufacturing Co.	-	175	175	30	W300	M250	250	40
P.O. Box 608					-	-	625	18
Savannah, GA 31402					-	-		
					-	-		
					-	-		
					-	-		
Dixie Machine Welding & Metal	A	350	300	100	NONE	NONE	1360	40
P.O. Box 53355					-	-	1360	25
New Orleans, LA 70153					-	-		
					-	-		
					-	-		
					-	-		
DMI, Inc.	-	123	37	60	NONE	NONE	200	15
P. O. Box 71466					-	-	400	30
Charleston, SC 29415					-	-		
					-	-		
					-	-		
					-	-		
Dolphin Ship Repair	-	60	25	10	NONE	NONE	NONE	N/A
1316 Smith Douglas Road					-	-	-	N/A
Chesapeake, VA 23324					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Dorchester Industries, Inc.	-	65	65	50	W180	M175	150	15
Shipyard Division Front Street					W180	M110	670	15
Dorchester, NJ 08316					W180	-		
					-	-		
					-	-		
					-	-		
Duwamish Shipyard, Inc.	-	240	80	60	W120	G435	300	40
5658 West Marginal Way, S.W.					-	F200	833	25
Seattle, WA 98106					-	F135		
					-	M120		
					-	-		
					-	-		
E & S Marine Service, Inc.	-	50	16	10	NONE	NONE	NONE	N/A
163-171 Dwight Street					-	-	-	N/A
Brooklyn, NY 11231					-	-		
					-	-		
					-	-		
					-	-		
Eastern Shipyards, Inc. *	-	929	929	100	W395	M130	600	12
P.O. Box 1171					W195	-	800	14
Panama City, FL 32402					W195	-		
					-	-		
					-	-		
					-	-		
Eastern Technical Enterprises	A	90	0	50	NONE	NONE	600	23
2429 Ferry Road					-	-	600	21
Virginia Beach, VA 23455					-	-		
					-	-		
					-	-		
					-	-		
Edward E. Gillen Company	-	40	5	10	NONE	NONE	3000	28
218 W. Becher Street					-	-	3000	29
Milwaukee, WI 53207					-	-		
					-	-		
					-	-		
					-	-		
Farmer's Marine Copper Works	-	150	100	80	NONE	NONE	350	18
P.O. Box 748					-	-	350	40
Galveston, TX 77553					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS Max 82-88	Oct'82	Jan'88 (Aprx)	FACILITIES Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
First Coast Shipbuilding	-	80	0	80	W250	NONE	500	12
P.O. Box 1808					-	-	500	12
Green Cove Springs, FL 32043					-	-		
					-	-		
					-	-		
					-	-		
Fischer Marine Repair Corp.	-	25	9	20	NONE	NONE	NONE	N/A
38 Coffey Street					-	-	-	N/A
Brooklyn, NY 11231					-	-		
					-	-		
					-	-		
					-	-		
Fishermen's Boat Shop, Inc.	-	45	30	40	L130	M130	450	35
1016 14th Street					-	-	1750	35
Everett, WA 98201					-	-		
					-	-		
					-	-		
					-	-		
Flohr Metal Fabricators, Inc.	-	75	31	40	W200	NONE	250	30
P.O. Box 70469					W150	-	250	10
Seattle, WA 98107					W120	-		
					-	-		
					-	-		
					-	-		
Foss Shipyard	A	180	90	150	NONE	F210	410	28
660 West Ewing Street					-	F200	1560	18
Seattle, WA 98119					-	-		
					-	-		
					-	-		
					-	-		
Fraser Shipyards, Inc.	C	600	328	50	G830	G625	1000	27
P.O. Box 997					G130	-	5300	18
Superior, WI 54880					-	-		
					-	-		
					-	-		
					-	-		
Fredeman Shipyard, Inc.	A	120	120	80	W250	F300	450	40
P.O. Box 129					-	F300	1700	16
Sulphur, LA 70663					-	F300		
					-	M208		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Freeport Shipbldg & Marine Rpr	-	80	15	20	L150	M100	NONE	10
P.O. Box 417					-	-	-	N/A
Freeport, FL 32439					-	-		
					-	-		
					-	-		
					-	-		
Fulton Shipyard, Inc.	-	66	50	20	NONE	M125	120	35
P.O. Box 400					-	-	120	10
Antioch, CA 94509-0039					-	-		
					-	-		
					-	-		
					-	-		
G & W Industries, Inc.	A	100	27	70	NONE	NONE	800	24
1898 Carter Road					-	-	800	24
Cleveland, OH 44113					-	-		
					-	-		
					-	-		
					-	-		
G. Marine Diesel Corp.	-	28	24	40	NONE	NONE	NONE	N/A
528 Columbia Street					-	-	-	N/A
Brooklyn, NY 11231					-	-		
					-	-		
					-	-		
					-	-		
G. Marine Diesel of Florida	-	10	5	10	NONE	NONE	NONE	N/A
P. O. Box 350630					-	-	-	N/A
Fort Lauderdale, FL 33335					-	-		
					-	-		
					-	-		
					-	-		
G. Marine Diesel of Virginia	-	9	0	10	NONE	F326	1000	25
307 Campostella Road					-	-	1150	22
Norfolk, VA 23523					-	-		
					-	-		
					-	-		
					-	-		
General Dynamics Electric Boat	C	20345	17711	16500	L560-4	G625	750	40
Eastern Point Road					W530	G600	3169	40
Groton, CT 06340					W530	G515		
					W475	-		
					W475	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
General Electric Co.- Mass.	-	50	0	10	NONE	NONE	NONE	N/A
29 Sawyer Road, Bldg #1					-	-	-	N/A
Waltham, MA 02254					-	-		
					-	-		
					-	-		
					-	-		
General Electric Co.- N.J.	-	75	75	30	NONE	NONE	NONE	N/A
Paramus Plaza IV					-	-	-	N/A
Paramus, NJ 07652					-	-		
					-	-		
					-	-		
					-	-		
General Electric Co.- Penn.	-	150	150	20	NONE	NONE	NONE	N/A
1000 First Avenue, Room 377					-	-	-	N/A
King of Prussia, PA 19406					-	-		
					-	-		
					-	-		
					-	-		
General Engineering & Machine	-	120	58	80	NONE	NONE	NONE	N/A
840 Harrison Street					-	-	-	N/A
San Francisco, CA 94107					-	-		
					-	-		
					-	-		
					-	-		
General Marine Service, Inc.	-	25	0	10	NONE	NONE	NONE	N/A
305 Third Street					-	-	-	N/A
Jersey City, NJ 07302					-	-		
					-	-		
					-	-		
					-	-		
General Offshore Corporation	-	150	60	150	NONE	NONE	NONE	N/A
P.O. Box 21726					-	-	-	N/A
Fort Lauderdale, FL 33335					-	-		
					-	-		
					-	-		
					-	-		
General Ship Corporation	C	345	279	250	NONE	G678	900	34
400 Border Street					-	-	2600	30
East Boston, MA 02128					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS Max 82-88	PRODUCTION WORKERS Oct'82	PRODUCTION WORKERS Jan'88 (Aprx)	FACILITIES Build Pos	FACILITIES Dock Pos	FACILITIES L-Pier T-Pier	FACILITIES Chan/ Berth
General Ship Repair Corp.	A	80	0	40	L100	F200	435	40
1449 Key Highway					-	-	845	20
Baltimore, MD 21230					-	-		
					-	-		
					-	-		
					-	-		
Gladding-Hearn Shipbuilding	-	30	30	60	M150	NONE	150	35
1 Riverside Avenue					-	-	150	10
Somerset, MA 02725					-	-		
					-	-		
					-	-		
					-	-		
Golten Marine Co.	-	26	26	30	NONE	NONE	NONE	N/A
322-330 Broad Avenue					-	-	-	N/A
Wilmington, CA 90744-5869					-	-		
					-	-		
					-	-		
					-	-		
Golten Marine Co., Inc.	-	40	40	40	NONE	NONE	NONE	N/A
160 Van Brunt Street					-	-	-	N/A
Brooklyn, NY 11231					-	-		
					-	-		
					-	-		
					-	-		
Goudy & Stevens	-	110	46	80	W240	M100	170	30
Church Street					W180	M100	270	18
East Boothbay, ME 04544					-	-		
					-	-		
					-	-		
					-	-		
Gowen Inc.	A	30	20	30	NONE	S110	500	45
P.O. Box 3542					-	-	1500	20
Portland, ME 04104					-	-		
					-	-		
					-	-		
					-	-		
Gretna Machine & Iron Works	-	415	180	100	G600	G320	1500	12
P.O. Box 215					-	-	1500	8
Harvey, LA 70059					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	**PRODUCTION WORKERS**			**FACILITIES**			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Gulf Coast Fabrication, Inc.	A	120	60	125	W600	NONE	500	30
P.O. Box 529					G390	-	4000	26
Pass Christian, MS 39571					-	-		
					-	-		
					-	-		
					-	-		
Gulf Copper & Mfg. Corp.	A	150	80	60	NONE	NONE	2400	40
320 Houston Avenue					-	-	2400	22
Port Arthur, TX 77640					-	-		
					-	-		
					-	-		
					-	-		
Gulf Craft, Inc.	-	120	110	70	W145	NONE	200	12
Rural Route #1, Box 395					W145	-	350	12
Patterson, LA 70392					W100	-		
					-	-		
					-	-		
					-	-		
Gulf Marine Repair	C	360	162	250	NONE	F450	800	34
1200 Sertoma Drive					-	F180	2800	36
Tampa, FL 33605					-	-		
					-	-		
					-	-		
					-	-		
Gunderson, Inc.	-	750	325	10	W750	AVAIL	1000	40
4350 N.W. Front Avenue					-	-	1000	30
Portland, OR 97210					-	-		
					-	-		
					-	-		
					-	-		
H Hansen Industries	A	100	15	20	NONE	NONE	800	27
2824 Summit Street					-	-	1150	14
Toledo, OH 43611					-	-		
					-	-		
					-	-		
					-	-		
Halter Marine, Inc.- Equitable	A	1124	1124	90	W310	NONE	400	30
P.O. Box 8001					W110	-	1318	45
New Orleans, LA 70182					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS Max 82-88	Oct'82	Jan'88 (Aprx)	FACILITIES Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Halter Marine, Inc.- Moss Point	-	530	530	175	V400	NONE	215	14
P.O. Box 767					V300	-	640	20
Moss Point, MS 39563					-	-		
					-	-		
					-	-		
					-	-		
Harrison Bros. DD & Repair Yd.	-	30	25	30	V150	F164	150	40
P.O. Box 1843					-	F130	500	10
Mobile, AL 36601					-	M150		
					-	-		
					-	-		
					-	-		
HBC Barge, Inc.	-	480	55	175	V220	M320	300	9
P.O. Box 510					V220	-	750	8
Brownsville, PA 15417					-	-		
					-	-		
					-	-		
					-	-		
Hendry Corporation	A	90	80	70	NONE	F235	1000	18
P.O. Box 13228					-	F235	1000	18
Tampa, FL 33681					-	-		
					-	-		
					-	-		
					-	-		
Henry Knese, Inc.	-	40	30	30	NONE	NONE	NONE	N/A
22-44 119th Street					-	-	-	N/A
New York, NY 11356					-	-		
					-	-		
					-	-		
					-	-		
Holmes Brothers Enterprises	-	100	37	70	NONE	NONE	NONE	N/A
P.O. Box 3246					-	-	-	N/A
Portsmouth, VA 23701					-	-		
					-	-		
					-	-		
					-	-		
Honolulu Shipyards, Inc.	A	260	188	250	NONE	F200	600	40
Pier 41, P.O. Box 30989					-	M223	800	30
Honolulu, HI 96820					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Houma Fabricators, Inc.	–	130	85	70	W240	NONE	275	16
1100 Oak Street					–	–	800	16
Houma, LA 70363					–	–		
					–	–		
					–	–		
					–	–		
Houston Ship Repair	A	180	105	125	NONE	NONE	700	22
P.O. Box 489					–	–	700	20
Channelview, TX 77530					–	–		
					–	–		
					–	–		
					–	–		
Huckins Yacht Corporation	–	71	20	50	L100	S100	65	10
P.O. Box 7069					–	–	440	10
Jacksonville, FL 32210					–	–		
					–	–		
					–	–		
					–	–		
Hudson Drydocks, Inc.	–	98	69	50	NONE	F260	250	14
P.O. Box 1781					–	F260	300	14
Morgan City, LA 70381					–	F165		
					–	M115		
					–	–		
					–	–		
Hunters Point Shipyard	C	0	0	0	NONE	G1092	1390	30
c/o SUPSHIP San Francisco					–	G1005	7740	36
San Francisco, CA 94124					–	G742		
					–	G410		
					–	G410		
					–	G410		
Hydraulic Fishing Supply, Inc.	–	46	35	50	W180	NONE	NONE	N/A
720 30th Street					–	–	–	N/A
Anacortes, WA 98221					–	–		
					–	–		
					–	–		
					–	–		
Industrial Welding & Machine	–	110	25	40	NONE	NONE	300	40
430 Commercial Street					–	–	300	10
Portland, ME 04104					–	–		
					–	–		
					–	–		
					–	–		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Ingalls Shipbuilding Division	C	10938	9599	9600	W690	F850	2500	38
P.O. Box 149					W650-4	G460	9850	35
Pascagoula, MS 39568-0149					W550	-		
					L850-5	-		
					-	-		
					-	-		
Intermarine USA	C	357	0	150	L200	G536	380	26
P.O. Box 3045					-	-	760	26
Savannah, GA 31402					-	-		
					-	-		
					-	-		
					-	-		
International Ship Repair, Inc.	A	200	100	60	NONE	NONE	675	31
1616 Penny Street					-	-	675	31
Tampa, FL 33605					-	-		
					-	-		
					-	-		
					-	-		
Intracoastal City DD & Shpbldg	-	80	40	30	W250	F210	400	14
Route 6, Box 792					-	F200	400	14
Abbeville, LA 70510					-	F130		
					-	F100		
					-	-		
					-	-		
J. M. Martinac Shipbuilding	-	203	203	50	W250	NONE	72	27
401 East 15th Street					W250	-	140	19
Tacoma, WA 98421					-	-		
					-	-		
					-	-		
					-	-		
Jacksonville Shipyards, Inc. *	C	2200	2000	600	W500	F900	800	34
P.O. Box 2347					-	F745	8000	34
Jacksonville, FL 32203					-	F400		
					-	F220		
					-	F200		
					-	-		
Jakobson Shipyard, Inc.	-	100	65	30	W135	M150	500	13
West End Avenue					W135	M100	1000	15
Oyster Bay, NY 11771					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Janoush Marine, Inc.	-	80	75	20	F182	F162	195	9
P.O. Box 640					-	-	195	9
Rosedale, MS 38769					-	-		
					-	-		
					-	-		
					-	-		
Jay Maritime Agency Corp.	-	40	18	10	W200	NONE	NONE	N/A
451 Spencer Street					-	-	-	N/A
Staten Island, NY 10314					-	-		
					-	-		
					-	-		
					-	-		
JoMar Corp. of Tidewater	A	125	50	50	NONE	NONE	500	30
P.O. Box 5119					-	-	500	24
Suffolk, VA 23435					-	-		
					-	-		
					-	-		
					-	-		
Jonathan Corporation *	A	700	139	450	NONE	NONE	558	40
150 Boush Street					-	-	1900	32
Norfolk, VA 23510					-	-		
					-	-		
					-	-		
					-	-		
Keehi Marine, Inc.	-	40	0	40	W130	S110	300	32
24 Sand Island Road					-	-	415	25
Honolulu, HI 96819					-	-		
					-	-		
					-	-		
					-	-		
Ketchikan Shipyard, Inc.	C	44	0	20	NONE	F500	1000	120
P.O. Box 7178					-	-	1000	35
Ketchikan, AK 99901					-	-		
					-	-		
					-	-		
					-	-		
Kettenburg Marine	-	85	70	60	W110	S100	500	35
P.O. Box 6448					-	-	650	12
San Diego, CA 92106					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
KMD Ship Repair of Cape Canav.	-	75	8	20	NONE	NONE	NONE	N/A
234 S.W. 29th Street					-	-	-	N/A
Fort Lauderdale, FL 33315					-	-		
					-	-		
					-	-		
					-	-		
Koch-Ellis Barge & Ship Svc.	-	25	25	10	NONE	NONE	450	40
P.O. Box 9130					-	-	2000	20
Westwego, LA 70094					-	-		
					-	-		
					-	-		
					-	-		
Kremer Marine, Inc.	-	20	15	20	W100	NONE	100	10
1408 Cowan Road					-	-	500	11
Gulfport, MS 39501					-	-		
					-	-		
					-	-		
					-	-		
Lake Union Drydock Company	A	220	97	90	W175	F340	1000	30
1515 Fairview Avenue East					W175	F240	4200	35
Seattle, WA 98102					-	F240		
					-	-		
					-	-		
					-	-		
Lamarco, Inc.	-	50	22	30	NONE	NONE	1000	35
P.O. Box 3449					-	-	1000	35
New Orleans, LA 70177					-	-		
					-	-		
					-	-		
					-	-		
Lantana Boatyard, Inc.	-	240	180	20	S130	NONE	257	8
808 N. Dixie Highway					L130	-	4200	8
Lantana, FL 33462					-	-		
					-	-		
					-	-		
					-	-		
LEEVAC Shipyards	-	300	280	175	W400	F250	800	12
P.O. Box 1190					W200	-	2000	10
Jennings, LA 70546					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Legnos Boat Industries, Inc.	-	8	8	10	NONE	NONE	NONE	N/A
973 North Road, Route 117					-	-	-	N/A
Groton, CT 06340					-	-		
					-	-		
					-	-		
					-	-		
Little Harbor Marine	-	79	0	20	L130	L130	1200	32
P.O. Box 42					-	-	1200	32
Portsmouth, RI 02871					-	-		
					-	-		
					-	-		
					-	-		
Lockheed Shipbuilding Co.	A	350	102	350	W200	S200	430	16
P.O. Box 9666					-	-	1310	18
Savannah, GA 31412					-	-		
					-	-		
					-	-		
					-	-		
Long Beach Naval Shipyard	C	4753	3259	3000	NONE	G1067	1720	43
Code 100					-	G667	13510	46
Long Beach, CA 90822-5099					-	G667		
					-	-		
					-	-		
					-	-		
Louisiana Dock Co.	-	145	119	90	NONE	M300	195	10
P.O. Box 610					-	F250	500	10
Jeffersonville, IN 47130					-	F200		
					-	F200		
					-	F195		
					-	-		
Louisiana Dock Company	-	240	203	70	NONE	F240	1050	40
P.O. Box 23206					-	F200	1050	10
Harahan, LA 70183					-	F200		
					-	-		
					-	-		
					-	-		
Lyon Shipyard, Inc.	-	130	61	80	NONE	M300	300	25
P.O. Box 2180					-	M200	300	25
Norfolk, VA 23501					-	M150		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
M & W Marine Services, Inc.	A	110	40	100	W125	F120	450	17
601 Jefferson Avenue					-	-	450	15
Newport News, VA 23607-6113					-	-		
					-	-		
					-	-		
					-	-		
Main Iron Works, Inc.	-	350	350	125	W180	F200	300	15
P.O. Box 1918					W180	F160	500	15
Houma, LA 70361					W180	F150		
					-	F140		
					-	F100		
					-	-		
Mainstream Shipyards & Supply	-	140	120	80	W200	F160	350	12
P.O. Box 1559					-	F140	350	35
Greenville, MS 38701					-	F100		
					-	-		
					-	-		
					-	-		
Marathon LeTourneau - Gulf Div	C	950	849	225	L1100	NONE	1600	18
P.O. Box 3189					-	-	2100	28
Brownsville, TX 78520					-	-		
					-	-		
					-	-		
					-	-		
Marathon LeTourneau - Marine Div	-	1476	25	225	W150	NONE	NONE	12
LeTourneau Rural Station					-	-	-	N/A
Vicksburg, MS 39180					-	-		
					-	-		
					-	-		
					-	-		
MARCO Seattle	-	250	160	100	W220	F220	250	30
2300 W. Commodore Way					W200	F120	500	25
Seattle, WA 98199					W108	F108		
					-	-		
					-	-		
					-	-		
Mare Island Naval Shipyard	C	6069	6069	5300	W519	G719	3950	36
Code 100					W467	G672	19270	39
Vallejo, CA 94592					-	G499		
					-	G420		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Marine & Industrial Svcs. Inc. P.O. Box 1855 San Juan, PR 00903	-	19	15	10	NONE - - - - -	NONE - - - - -	200 200	40 28
Marine Hydraulics Internat'l 543 E. Indian River Road Norfolk, VA 23523	A	300	122	175	NONE - - - - -	NONE - - - - -	650 2150	28 28
Marine Industries Northwest P.O. Box 1275 Tacoma, WA 98401	-	210	88	200	NONE - - - - -	M200 - - - - -	350 550	20 20
Marine Power & Equip. Co. * 1441 N. Northlake Way Seattle, WA 98103	C	520	325	100	L700 L650 L250 L180 - -	F400 F400 F300 F220-3 S400 -	1100 3000	25 40
Marine Repairs, Inc. P.O. Box 5307 Houston, TX 77262	-	16	16	10	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Marinette Marine Corporation Ely Street Marinette, WI 54143	A	925	645	800	W300-2 W250 W250 W250 W250 W150	S125 S125 - - - -	1070 2135	21 20
Marisco Ltd. 91-601 Malakole Road Ewa Beach, HI 96707	-	80	30	70	NONE - - - - -	F500 - - - - -	AVAIL -	34 N/A

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Maritime Contractors, Inc.	A	110	0	80	NONE	F390	1350	30
201 Harris Avenue					-	F200	2200	34
Bellingham, WA 98225					-	M120		
					-	-		
					-	-		
					-	-		
Master Boat Builders, Inc.	-	100	100	70	W190	NONE	200	15
P.O. Box 702					W115	-	380	15
Bayou La Batre, AL 36509					-	-		
					-	-		
					-	-		
					-	-		
Master Marine, Inc.	-	202	64	90	W250	F180	400	14
P.O. Box 665					W180	F100	1890	12
Bayou La Batre, AL 36509					W105	-		
					-	-		
					-	-		
					-	-		
McDermott Int'l - Morgan City SY	A	985	370	325	L300	F250	600	20
P.O. Box 588					L300	F180	800	20
Amelia, LA 70340					L220	F160		
					L220	F154		
					-	F150		
					-	-		
McDonough Iron Works	-	305	90	40	NONE	NONE	NONE	N/A
2701 New Strand					-	-	-	N/A
Galveston, TX 77550					-	-		
					-	-		
					-	-		
					-	-		
Melville Marine Industries	A	150	0	80	W130	S130	1200	30
One Little Harbor Landing					-	-	1200	32
Portsmouth, RI 02871					-	-		
					-	-		
					-	-		
					-	-		
Merce Industries, Inc.	C	300	0	100	G540	G680	800	21
2245 Front Street					-	-	1610	21
Toledo, OH 43605					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Merrill-Stevens Drydock Co.	-	140	77	150	NONE	M145	250	13
P.O. Box 1980					-	S145	675	9
Miami, FL 33101					-	-		
					-	-		
					-	-		
					-	-		
Metal Trades, Inc.	-	339	218	200	NONE	M300	325	20
P.O. Box 129					-	M208	560	26
Hollywood, SC 29449-0129					-	-		
					-	-		
					-	-		
					-	-		
Metro Machine Corporation	C	512	249	550	NONE	F675	785	30
P.O. Box 1860					-	-	2500	35
Norfolk, VA 23501					-	-		
					-	-		
					-	-		
					-	-		
Miami Shipyards Corporation	-	120	120	70	L102	M185	240	15
615 S.W. 2nd Avenue					-	M125	490	13
Miami, FL 33130					-	-		
					-	-		
					-	-		
					-	-		
Mid-Coast Marine Oregon Corp.	-	150	56	100	W350	F350	220	31
P.O. Box 59					-	F350	1500	30
Coos Bay, OR 97420					-	F220		
					-	F110		
					-	-		
					-	-		
Mississippi Marine Corp.	-	230	70	80	L300	F350	NONE	26
P.O. Box 539					L300	F280	-	N/A
Greenville, MS 38702-0539					L300	F180		
					L300	-		
					-	-		
					-	-		
Missouri Drydock & Repair Co.	-	85	85	60	W120	F180	NONE	32
P.O. Box 700					W120	F180	-	32
Cape Girardeau, MO 63701					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS Max 82-88	Oct'82	Jan'88 (Aprx)	FACILITIES Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Modutech Marine, Inc.	-	70	70	40	NONE	NONE	100	36
2218 Marine View Drive					-	-	100	30
Tacoma, WA 98422					-	-		
					-	-		
					-	-		
					-	-		
Monark Boat Company	-	470	42	300	NONE	NONE	NONE	N/A
P.O. Box 210					-	-	-	N/A
Monticello, AR 71655					-	-		
					-	-		
					-	-		
					-	-		
Moon Engineering Co., Inc. *	A	335	86	200	NONE	NONE	612	40
P. O. Box 7909					-	-	2400	35
Portsmouth, VA 23707					-	-		
					-	-		
					-	-		
					-	-		
Moss Point Marine, Inc.	-	365	270	250	W400	NONE	375	14
P.O. Box 1310					W300	-	1000	15
Escatawpa, MS 39552					W225	-		
					-	-		
					-	-		
					-	-		
Muller Boat Works, Inc.	-	20	15	20	NONE	M130	110	16
2214 E. 69th Street					-	M130	440	15
Brooklyn, NY 11234					-	-		
					-	-		
					-	-		
					-	-		
Nashville Bridge Company	-	640	231	275	W380	M200	NONE	10
P.O. Box 239					W300	-	-	N/A
Nashville, TN 37202					W300	-		
					-	-		
					-	-		
					-	-		
National Maintenance & Repair	-	500	400	200	NONE	F220	1170	9
P.O. Box 38					-	F200	1470	20
Hartford, IL 62048					-	F200		
					-	F160		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
National Sea Products, Inc.	-	40	31	30	NONE	M200	275	30
79 Mechanical Street					-	-	750	16
Rockland, ME 04841					-	-		
					-	-		
					-	-		
					-	-		
National Steel & Shipbuilding	C	5000	4575	2300	G980	F750	960	35
P.O. Box 85278					W900	-	6500	32
San Diego, CA 92138					W900	-		
					W690	-		
					-	-		
					-	-		
New York Shipyard Corporation	C	150	100	150	NONE	G715	1250	32
1 Beard Street					-	F580	7518	40
Brooklyn, NY 11231					-	F370		
					-	F200		
					-	-		
					-	-		
Newpark Shipbuilding & Repair	A	250	250	175	W300	F150	450	30
P.O. Box 5426					W300	F200	2000	25
Houston, TX 77012					W150	M275		
					W150	M225		
					W150	F220		
					W150	-		
Newport News Shipbuilding	C	23341	19826	20500	G1600	G865	1370	45
4101 Washington Avenue					G1100	G637	8077	45
Newport News, VA 23607					G960	G525		
					W668	G468		
					W447	F700		
					L600-4	-		
Newport Offshore, Ltd.	A	330	112	70	NONE	M300	1450	45
1 Washington Street					-	L160	3920	35
Newport, RI 02840					-	-		
					-	-		
					-	-		
					-	-		
Nichols Brothers Boatbuilders	-	120	120	100	W265	NONE	195	25
5400 S. Cameron Road					-	-	195	16
Freeland, WA 98249					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS Max 82-88	Oct'82	Jan'88 (Aprx)	FACILITIES Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Nicholson & Hall Corporation	-	225	12	125	NONE	NONE	AVAIL	N/A
41 Columbia Street					-	-	AVAIL	N/A
Buffalo, NY 14203					-	-		
					-	-		
					-	-		
					-	-		
Nicholson Terminal & Dock Co.	A	200	80	80	NONE	F225	2000	26
P.O. Box 66					-	-	3500	26
River Rouge, MI 48218					-	-		
					-	-		
					-	-		
					-	-		
NICOR National Louisiana, Inc.	-	200	150	90	NONE	F200	700	11
P.O. Box 1148					-	F160-2	1000	7
Harvey, LA 70059					-	F150		
					-	F140		
					-	-		
					-	-		
Nordic Diesel & Machine Co.	-	22	18	10	NONE	NONE	NONE	N/A
100 Hamilton Avenue					-	-	-	N/A
Brooklyn, NY 11231					-	-		
					-	-		
					-	-		
					-	-		
Norfolk Naval Shipyard	C	6668	5592	6100	NONE	G1082	1265	40
Code 100					-	G1002	20000	40
Portsmouth, VA 23709-5000					-	G712		
					-	G486		
					-	G456-2		
					-	G309		
Norfolk Shipbldg. & DD Co. *	C	3922	3630	3600	W350	F1000	1030	45
P.O. Box 2100					-	F750	11810	42
Norfolk, VA 23501-2100					-	M450		
					-	F250		
					-	M260		
					-	M257		
Norlantic Diesel, Inc.	-	31	31	20	NONE	M104	220	32
P.O. Box 151					-	M100	490	18
Fairhaven, MA 02719					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
North American Shipbuilding	-	275	200	140	W300	NONE	1000	14
P.O. Box 308					-	-	1000	12
Larose, LA 70373					-	-		
					-	-		
					-	-		
					-	-		
North Florida Shipyard, Inc.	C	600	225	250	NONE	F500	950	32
P.O. Box 3255					-	-	3240	32
Jacksonville, FL 32206					-	-		
					-	-		
					-	-		
					-	-		
Northwest Marine Iron Works	C	2000	1141	1400	AVAIL	AVAIL	AVAIL	40
P.O. Box 3109					-	-	-	40
Portland, OR 97208					-	-		
					-	-		
					-	-		
					-	-		
Offshore Shipbuilding	-	360	360	50	W300	NONE	1500	12
Route #3, Box 4785					-	-	1500	18
Palatka, FL 32077					-	-		
					-	-		
					-	-		
					-	-		
Oldman Boiler Works	-	20	20	10	NONE	NONE	NONE	N/A
32 Illinois Street					-	-	-	N/A
Buffalo, NY 14203					-	-		
					-	-		
					-	-		
					-	-		
Olympic Marine Service, Inc.	-	100	8	30	NONE	NONE	NONE	N/A
459 Degraw Street					-	-	-	N/A
Brooklyn, NY 11217					-	-		
					-	-		
					-	-		
					-	-		
Orange Shipbuilding Co., Inc.	-	100	35	30	W390	S300	1000	25
P.O. Box 1670					-	L150-6	1000	25
Orange, TX 77630-0518					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Pacific Drydock & Repair Co.	A	232	124	40	NONE	F390	600	32
321 Embarcardero					-	M160	2400	25
Oakland, CA 94606					-	-		
					-	-		
					-	-		
					-	-		
Pacific Fisherman, Inc.	A	98	36	20	NONE	M140	500	25
5351 24th Avenue, N.W.					-	S160	1300	30
Seattle, WA 98107					-	-		
					-	-		
					-	-		
					-	-		
Pacific Marine Ship Repair Inc	-	80	0	60	L210	M210	335	25
Port of Umpqua Industrial Park					-	-	400	23
Reedsport, OR 97467					-	-		
					-	-		
					-	-		
					-	-		
Pacific Ship Repair & Fab.	A	835	835	200	NONE	NONE	600	36
1625 Rigel Street					-	-	600	36
San Diego, CA 92113					-	-		
					-	-		
					-	-		
					-	-		
Palmer Johnson, Inc.	-	128	88	125	W125	NONE	180	14
61 Michigan Street					W100	-	208	14
Sturgeon Bay, WI 54235					-	-		
					-	-		
					-	-		
					-	-		
Patti Shipyard, Inc.	-	80	20	30	W350	NONE	300	12
P.O. Box 271					-	-	430	14
Pensacola, FL 32592					-	-		
					-	-		
					-	-		
					-	-		
Pearl Harbor Naval Shipyard	C	3750	3432	2800	NONE	G1100	1670	45
P.O. Box 400					-	G1000	19940	40
Pearl Harbor, HI 96860					-	G1000		
					-	G580		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Pearson Yachts West Shore Road Portsmouth, RI 02871	-	375	239	250	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Pennsylvania Shipbuilding Co. P.O. Box 498 Chester, PA 19016	C	1952	827	1400	L1100 W740 W740 L720 - -	F1100 F400 - - - -	1100 6230	40 35
Perth Amboy Dry Dock Company P.O. Box 348 Perth Amboy, NJ 08862	C	121	90	80	NONE - - - - -	F490 F367 F334 F180 - -	385 2180	30 24
Peterson Builders, Inc. 101 Pennsylvania Street Sturgeon Bay, WI 54235-0650	C	995	487	650	W410 W225 W220-2 W160-2 W130 W120-2	F342 - - - - -	410 1795	24 20
Philadelphia Naval Shipyard Code 100 Philadelphia, PA 19112	C	6644	6644	5500	NONE - - - - -	G1082 G1082 G984 G718 G432 -	1150 9920	40 40
PHILLYSHIP P.O. Box 1799 Philadelphia, PA 19105-1799	-	150	150	100	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Platzer Shipyard, Inc. P.O. Box 24399 Houston, TX 77229	-	150	130	150	W300 W200 - - - -	M300 L300 L300 L300 L300 -	300 1000	14 8

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS Max 82-88	Oct'82	Jan'88 (Aprx)	FACILITIES Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Port Allen Marine Service Inc.	-	700	400	175	V297	F210	1060	12
P.O. Box 108					V250	F150	1940	15
Port Allen, LA 70767					V195	F150		
					-	-		
					-	-		
					-	-		
Port Bienville Industries, Inc.	-	120	110	20	V150	NONE	320	14
P.O. Box 92					-	-	320	8
Pearlington, MS 39572					-	-		
					-	-		
					-	-		
					-	-		
Portland Ship Repair Yard	-	92	85	80	L1000	F1100	3000	40
5555 N. Channel Ave., Bldg. 50					L600	F810	10300	40
Portland, OR 97208					-	F634		
					-	-		
					-	-		
					-	-		
Portsmouth Naval Shipyard	C	4474	4275	3600	W432	G686	700	40
Code 100					W397	G486	2210	39
Portsmouth, NH 03801-5000					W397	G433		
					W397	-		
					-	-		
					-	-		
Promet Marine Services Corp.	A	44	27	40	NONE	S150	600	36
242 Allens Avenue					-	-	1700	36
Providence, RI 02905					-	-		
					-	-		
					-	-		
					-	-		
Puget Sound Naval Shipyard	C	6622	5853	5700	NONE	G1152	1400	36
Code 100					-	G1000	25000	40
Bremerton, WA 98314-5000					-	G998		
					-	G927		
					-	G867		
					-	G639		
Quality Boats Company, Inc.	-	15	3	20	NONE	NONE	30	4
Victory & Deep Creek Blvds.					-	-	150	4
Portsmouth, VA 23702					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Quality Shipbuilders, Inc.	-	135	100	30	W250	NONE	250	12
P.O. Box 704					-	-	500	16
Moss Point, MS 39563					-	-		
					-	-		
					-	-		
					-	-		
Quality Shipyards, Inc.	-	350	350	125	W600	F230	300	16
P.O. Box 1817					-	F190	1000	16
Houma, LA 70361-1817					-	F190		
					-	-		
					-	-		
					-	-		
R. E. Derecktor of R.I., Inc.	C	975	700	550	L500	F475	1525	30
Coddington Cove					L375	F200	2600	35
Middletown, RI 02840					L375	-		
					-	-		
					-	-		
					-	-		
R. E. Derecktor, Inc.	-	91	91	70	NONE	NONE	450	20
311 East Boston Post Road					-	-	640	10
Mamoroneck, NY 10543					-	-		
					-	-		
					-	-		
					-	-		
R. J. Rotundo, Inc.	A	260	0	225	W600	F160	610	21
400 Lake Street					-	-	610	20
Ontonagon, MI 49953					-	-		
					-	-		
					-	-		
					-	-		
Red Fox Industries, Inc.	-	400	359	100	W280	NONE	610	12
P.O. Box 13810					-	-	909	12
New Iberia, LA 70562					-	-		
					-	-		
					-	-		
					-	-		
Reynolds Shipyard Corporation	A	50	40	30	NONE	NONE	440	40
200 Edgewater Street					-	-	880	17
Staten Island, NY 10305					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Runyan Machine & Boiler Works	-	180	50	125	NONE	M240	220	16
P.O. Box 12483					-	M150	637	14
Pensacola, FL 32573					-	M100		
					-	-		
					-	-		
					-	-		
Ryan Marine, Inc.	-	32	0	30	W310	F150	200	12
P.O. Box 400					-	-	1400	10
Pearlington, MS 39572-0400					-	-		
					-	-		
					-	-		
					-	-		
RYSCO, Inc.	-	160	160	40	W250	S100	200	12
P.O. Box 662					-	-	1400	18
Rockport, TX 78382					-	-		
					-	-		
					-	-		
					-	-		
San Diego Shipbldg. & Repair	-	175	20	125	W300	S200	NONE	35
980 'F' Street					-	L200-6	-	20
Chula Vista, CA 92010					-	L200-6		
					-	-		
					-	-		
					-	-		
San Juan Shipyards, Inc.	-	55	55	20	NONE	M240	300	20
P.O. Box 13952					-	M150	1348	14
Santurce, PR 00908					-	-		
					-	-		
					-	-		
					-	-		
Saucer Marine Service, Inc.	-	90	75	50	NONE	F340	300	50
P.O. Box 3067					-	F300	300	18
New Orleans, LA 70177-3067					-	F300		
					-	F200		
					-	-		
					-	-		
SBA Shipyards, Inc.	-	256	100	100	W420	G500	1000	40
P.O. Box 1386					W300	M400	2000	10
Jennings, LA 70546					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Service Engineering Company	A	976	320	700	NONE	NONE	900	40
P.O. Box 7714					-	-	2700	35
San Francisco, CA 94120					-	-		
					-	-		
					-	-		
					-	-		
Service Marine Industries, Inc	-	220	88	70	V200	F200	150	16
P.O. Box 3606					-	F165	250	12
Morgan City, LA 70381					-	F130		
					-	-		
					-	-		
					-	-		
South Point Barge Co., Inc.	-	15	13	10	NONE	F100	NONE	40
P.O. Box 333					-	-	-	20
South Point, OH 45680					-	-		
					-	-		
					-	-		
					-	-		
South Portland Shipyard & MR	-	45	38	20	V105	M210	200	40
257 Front Street					-	-	600	15
South Portland, ME 04106					-	-		
					-	-		
					-	-		
					-	-		
Southern Oregon Marine, Inc.	A	102	56	100	L395	M395	480	20
P.O. Box 1220					L200	F200	1800	24
Coos Bay, OR 97420					-	-		
					-	-		
					-	-		
					-	-		
Southern Shipbuilding Corp.	-	260	260	225	V600	G350	200	14
P.O. Box 1089					-	F200	250	16
Slidell, LA 70459					-	M200		
					-	M150		
					-	-		
					-	-		
Southwest Marine of San Diego	C	1000	695	850	NONE	F655	700	35
P.O. Box 13308					-	F320	2422	35
San Diego, CA 92113-0308					-	M235		
					-	M170		
					-	M120		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Southwest Marine of San Fran.	C	453	256	250	W550	F950	800	55
P.O. Box 7644 (Foot of 20th)					-	F700	4735	40
San Francisco, CA 94120-7644					-	F378		
					-	F220		
					-	-		
					-	-		
Southwest Marine of San Pedro	C	970	350	600	NONE	F720	1500	52
P.O. Box 3600					-	F420	3396	35
Terminal Island, CA 90731-7331					-	F220		
					-	-		
					-	-		
					-	-		
Southwestern Barge Fleet Svc.	-	130	109	80	NONE	F174	500	12
P.O. Box 845					-	F100	1700	12
Highlands, TX 77562					-	-		
					-	-		
					-	-		
					-	-		
St. Augustine Trawlers, Inc.	-	269	269	60	W250	M120	675	12
P.O. Box 619					W170	-	1040	12
St. Augustine, FL 32084					W120	-		
					W100	-		
					W100	-		
					-	-		
St. Louis Ship, Inc.	-	553	71	125	W205	NONE	220	9
P.O. Box 1134					L220	-	220	20
Caruthersville, MO 63830					-	-		
					-	-		
					-	-		
					-	-		
Steel Style, Inc.	A	200	125	70	NONE	M140	600	40
401 S. Water Street					-	M300	1100	12
Newburgh, NY 12550					-	-		
					-	-		
					-	-		
					-	-		
Steiner Shipyard, Inc.	-	150	90	100	W125	NONE	100	14
P.O. Box 742					W125	-	600	12
Bayou La Batre, AL 36509					L125-3	-		
					L125-3	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Stephen Ransom, Inc. Marsh & Intercoastal Streets Port Newark, NJ 07114	-	50	50	40	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Stevens Technical Service Inc. 145 34th Street Brooklyn, NY 11232	-	250	150	50	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Superior Boat Works, Inc. P.O. Box 326 Greenville, MS 38702-0326	-	350	150	50	W300 W300 - - - -	F160 F140 - - - -	500 800	12 12
Superior Marine, Inc. 3132 Victory Boulevard Portsmouth, VA 23702	-	89	0	20	NONE - - - - -	M100 - - - - -	280 840	8 8
Swiftships, Inc. 1105 Levee Road Morgan City, LA 70380	-	700	89	150	NONE - - - - -	F250 F210 S160 - - -	120 180	40 16
Swygert Shipyard, Inc. P.O. Box 308 Johns Island, SC 29455	A	300	227	150	NONE - - - - -	M200 - - - - -	500 900	35 35
Tacoma Boatbuilding Co. 1840 Marine View Drive Tacoma, WA 98422	C	2250	2147	300	W430 W430 W425 W425 - -	M200 - - - - -	680 1960	38 32

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C / A	PRODUCTION WORKERS Max 82-88	Oct'82	Jan'88 (Aprx)	FACILITIES Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Tampa Shipyards, Inc. P.O. Box 1277 Tampa, FL 33601	C	1750	633	175	G744 - - - - -	G900 G744 G546 - - -	845 3704	33 28
Technical Fiberglass, Inc. 205 Webb Street Clayton, NY 13624	-	12	0	10	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Textron Marine Systems 6800 Plaza Drive New Orleans, LA 70127	A	553	70	300	V300-8 V200-3 - - - -	NONE - - - - -	1270 2000	17 20
Thames Shipyard & Repair Co. P.O. Box 791 New London, CT 06320	-	60	58	40	V220 - - - - -	F220 - - - - -	300 900	38 30
Thomas A. Short Co. P.O. Box 8127 Emeryville, CA 94602	-	40	40	20	NONE - - - - -	NONE - - - - -	NONE -	N/A N/A
Thomas Marine, Inc. 37 Bransford Street Patchogue, NY 11772	-	14	8	10	NONE - - - - -	NONE - - - - -	60 1080	10 6
Tidewater Equipment Corp. P.O. Box 57 Norfolk, VA 23501	-	160	120	90	V360 - - - - -	NONE - - - - -	360 700	12 12

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Todd Marine Enterprises	-	150	60	80	NONE	NONE	100	8
508 E. Indian River Road					-	-	100	10
Norfolk, VA 23512					-	-		
					-	-		
					-	-		
					-	-		
Todd Pacific Shipyards-L.A.	C	4800	4129	1600	L800	S800	1300	45
P.O. Box 231					W725	-	4100	34
San Pedro, CA 90733-0231					W725	-		
					L600	-		
					-	-		
					-	-		
Todd Pacific Shipyards-Seattle	C	3948	3517	950	W450	F943	1400	40
P.O. Box 3806					W450	F650	4972	40
Seattle, WA 98124					W220	F420		
					-	-		
					-	-		
					-	-		
Todd Shipyards Corp.-Galveston	C	950	770	400	W475	F900	1086	40
P.O. Box 1550					-	F600	5108	35
Galveston, TX 77553					-	-		
					-	-		
					-	-		
					-	-		
Tony Stamis Engineering, Inc.	-	11	9	10	NONE	NONE	NONE	N/A
617-619 Broad Avenue					-	-	-	N/A
Ridgefield, NJ 07657					-	-		
					-	-		
					-	-		
					-	-		
Twin City Drydock & Marine	-	50	50	20	W170	F170	150	30
1065 E. Portage, P.O. Box 912					-	F140	150	20
Sault Ste. Marie, MI 49783					-	-		
					-	-		
					-	-		
					-	-		
U. S. Coast Guard Shipyard	A	500	500	425	W300	F300	1000	25
Curtis Bay (Code 360)					W300	F300	3500	25
Baltimore, MD 21226					-	-		
					-	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C/A	PRODUCTION WORKERS			FACILITIES			
		Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Union Drydock & Repair Co.	-	60	60	80	NONE	F360	390	20
P.O. Box M-1539					-	-	1310	20
Hoboken, NJ 07030					-	-		
					-	-		
					-	-		
					-	-		
Universal Metal Machine Works	-	45	40	20	NONE	NONE	NONE	N/A
608 Union Street					-	-	-	N/A
Brooklyn, NY 11215					-	-		
					-	-		
					-	-		
					-	-		
Vaello Shipyard, Inc.	-	30	30	30	NONE	M100	50	40
P.O. Box 188					-	-	100	12
Catano, PR 00632					-	-		
					-	-		
					-	-		
					-	-		
Vessel Repair, Inc.	A	65	0	40	W225	F275	1100	40
P.O. Box 2207					-	M165	2100	17
Port Arthur, TX 77643					-	-		
					-	-		
					-	-		
					-	-		
Walashek Industries	-	38	0	30	NONE	NONE	NONE	N/A
Pier 1, 607 Ala Moana Blvd.					-	-	-	N/A
Honolulu, HI 96813					-	-		
					-	-		
					-	-		
					-	-		
Walker Boat Yard, Inc.	-	180	125	180	W200	F400	500	12
P.O. Box 729					W140	F250	3000	18
Paducah, KY 42002-0729					-	F250		
					-	F250		
					-	F100		
					-	-		
Washburn & Doughty Assoc. Inc.	-	60	20	50	W245	NONE	130	30
P.O. Box 226					W180	-	185	20
East Boothbay, ME 04644					W180	-		
					W130	-		
					-	-		
					-	-		

OPEN SHIPYARDS, SHIP REPAIR FACILITIES AND BOAT YARDS

NAME	C	PRODUCTION WORKERS			FACILITIES			
	/ A	Max 82-88	Oct'82	Jan'88 (Aprx)	Build Pos	Dock Pos	L-Pier T-Pier	Chan/ Berth
Watercraft America, Inc.	-	107	107	90	NONE	NONE	NONE	N/A
P.O. Box 1340					-	-	-	N/A
Oak Hill, FL 32759					-	-		
					-	-		
					-	-		
					-	-		
West State, Inc.	C	566	0	550	AVAIL	AVAIL	AVAIL	N/A
P.O. Box 4768					-	-	-	N/A
Portland, OR 97208					-	-		
					-	-		
					-	-		
					-	-		
Westport Shipyard, Inc.	-	60	30	60	L120	M120	80	10
P.O. Box 308					-	-	80	10
Westport, WA 98595					-	-		
					-	-		
					-	-		
					-	-		
Willard Marine	-	80	40	60	NONE	NONE	NONE	N/A
1250 North Grove Street					-	-	-	N/A
Anaheim, CA 92806					-	-		
					-	-		
					-	-		
					-	-		
Wilmington Shipyard, Inc.	-	75	68	40	NONE	M240	225	30
P.O. Drawer 2028					-	-	675	14
Wilmington, NC 28402					-	-		
					-	-		
					-	-		
					-	-		
Yacht Maintenance Co., Inc.	-	75	58	30	L150	M150	220	28
101 Hayward Street					-	-	500	14
Cambridge, MD 21613					-	-		
					-	-		
					-	-		
					-	-		

APPENDIX D-2

CLOSED UNITED STATES SHIPYARDS: 1980 TO 1988

A complete listing of the facilities and employment history for shipyards and ship repair firms that have closed since 1980 was required in order for the Commission accurately to assess the decline in the shipbuilding industry. No single, complete source of data for closed shipyards existed. Several government and private agencies, including the Maritime Administration (MARAD), the Shipbuilders Council of America (SCA), and the American Waterways Shipyard Conference (AWSC), maintained records of some closed shipyards and ship repair facilities for their own use. Their data was collected and collated by the Commission staff, and extensive inquiries were made of the currently operating yards in an effort to create a comprehensive data base of closed firms and facilities.

The listing provided here is not considered all-inclusive, but it represents the best efforts of the Commission to identify those facilities and jobs lost as a result of shipyard closings between January 1980 and August 1988. Where blanks appear in the data, an accurate number or date was unavailable.

Shipyards on this list include only those firms that have been:

a. **Closed:** Facilities still exist, and are idle, but the company is out of business; includes facilities that are for sale, have been abandoned, or are not being maintained.

b. **Temporarily Closed:** Facilities that are in a care and maintenance status and that could readily be activated.

c. **Converted:** Property that has been converted to another use and is no longer operable as a shipyard.

Shipyards that have been sold to another firm or operator and are currently being used as shipyards are not included but are included in the open data base.

The data fields listed are defined as follows:

a. **NAME:** This data field contains the company name and last complete mailing address.

b. **CLOSED:**
Mon: This column indicates a three-letter abbreviation for the month in which the shipyard closed (if known).

Yr: This column indicates the last two digits of the year in which the shipyard closed (if known).

c. **JOBS:** This column indicates the best available information on the number of production workers who were employed at any time during the three years immediately preceding the closure of the shipyard and thus represents the number of production worker jobs lost. Production workers are defined as those personnel charged as direct labor to a particular job and include skilled, semiskilled, and unskilled workers; direct project engineers; first line supervisors; and quality control inspectors.

d. **FACILITIES:** The three columns indicate some of the key facilities data for each shipyard.

Build Pos: A single letter indicates the type of building position formerly available. The numerals following it indicate the maximum length of vessel (in feet) that could be constructed at that position; a hyphen and a number following the basic entry indicate multiple building positions of the same length. When a graving dock or marine railway was used for both construction and repair, it has been categorized by its most common use. Building positions with a maximum length of under 100 feet are not included.

G - Graving drydock
W - Building way
M - Marine railway
L - Land level position

Dock Pos: A single letter indicates the type of drydocking capability available. The numerals following it indicate the maximum length of vessel (in feet) that could be accommodated by the drydock; a hyphen and a number following the basic entry indicate multiple drydocks of the same length. Drydocks less than 100 feet in length are not included.

G - Graving drydock
F - Floating drydock
M - Marine railway
S - Synchro-lift
L - Land level position

L-Pier / T-Pier: The first value indicates the length (in feet) of the longest usable pier available in the shipyard. The second value indicates the cumulative total of usable pier length available (in feet).

e. **REMARKS:** Brief comments or additional information on the shipyard that may be of interest.

LIST OF CLOSED SHIPYARDS (1980 - 1988)

NAME	CLOSED		JOBS	FACILITIES			REMARKS
	Mon	Yr	Max Prv 3	Build Pos	Dock Pos	L-Pier T-Pier	Comments/Information
A. Moe & Company, Inc. 808 North Front Street Philadelphia, PA 19123	JUL	86	40	NONE - -	NONE - -	NONE -	- - -
Allied Repair Service, Inc. P.O. Box 2236 Norfolk, VA 23501	-	85	355	NONE - -	F400 F100 -	500 1000	May be reopened by new operator, unable to confirm. Had Navy MSR.
American Shipbuilding Co. - Chicago, ILL	FEB	82	60	NONE - -	G694 - -	850 1300	- - -
American Shipbuilding Co. - Lorain, OH	-	83	930	G1021 - -	G708 - -	900 1800	- - -
Arthur Tickle Engr. Works Inc. 26 Delevan Street Brooklyn, NY 11231	-	87	134	NONE - -	NONE - -	NONE -	Phone disconnected. Had Navy MSR & MARAD MLSR.
Bergeron Industries, Inc. P.O. Box 39 St. Bernard, LA 70085	-	85	50	W370 - -	M300 F120 -	100 600	- - -
BFC Marine Service, Inc. Pier 5, Bldg. 56, Furman St. Brooklyn, NY 11201	-	86	20	NONE - -	NONE - -	NONE -	Had MARAD MLSR. - -
Boeing Marine Systems P.O. Box 3707 Seattle, WA 98124	-	87	800	L140 - -	NONE - -	150 300	Returned to Aerospace use only. Had Navy MSR.
California Shipbldg & DD Co. 1601 Water Street Long Beach, CA 90802	DEC	82	210	NONE - -	F389 F220 F200	326 739	Equipt. from yard was sold to Southwest Marine, Inc.
Camden Ship Repair Co., Inc. Point and Erie Streets Camden, NJ 08102	MAY	86	60	NONE - -	M220 - -	NONE -	Sold to E.J.Brenneman Not used for ship repair. Had Navy MSR.

LIST OF CLOSED SHIPYARDS (1980 - 1988)

NAME	CLOSED		JOBS	FACILITIES			REMARKS
	Mon	Yr	Max Prv 3	Build Pos	Dock Pos	L-Pier T-Pier	Comments/Information
Cameron Shipbuilding	-	87	213	W200	NONE	100	No Survey response.
P.O. Box 5243				W200	-	100	No phone listing.
Brownsville, TX 78521				W200	-		-
Canal Marine Repairs, Inc.	-	-	45	NONE	M100	320	Had Navy MSR.
P.O. Box 8097				-	-	320	-
New Orleans, LA 70182				-	-		-
Cavanaugh Machine Works, Inc.	-	87	50	NONE	NONE	NONE	Company in business
220 East 'B' Street				-	-	-	no longer does ship
Wilmington, CA 90744				-	-		repair.
Cenac Shipyard	-	83	200	L350	S350	300	Company in business.
P.O. Box 2617				-	-	3000	Shipbuilding/repair
Houma, LA 70361				-	-		facilities not used.
Chicago Bridge & Iron Co.	JUL	86	800	NONE	NONE	650	Facilities in care
10 Washington Avenue				-	-	650	& maintenance status.
Pascagoula, MS 39567				-	-		-
Coastal Drydock & Repair Corp.	NOV	86	998	NONE	G1092	1400	Also had G465 & G349.
Bldg. 292, Brooklyn Navy Yard				-	G1092	5740	Company bankrupt.
Brooklyn, NY 11205				-	G760-2		-
Coastal Marine Engineering Co.	-	87	55	NONE	NONE	NONE	Survey form returned.
1050 25th Street				-	-	-	No phone listing.
San Francisco, CA 94107				-	-		-
Delta Shipyard, Inc.	-	85	131	W300	F340	1200	-
P.O. Box 101				W250	-	1200	-
Houma, LA 70361				W120	-		-
DESCO Marine, Inc.	OCT	86	500	W100	NONE	690	Sold in Mar 87
P.O. Box 1480				-	-	690	to Luhrs Corp.
St. Augustine, FL 32085				-	-		-
Dockside Machine & Repair	DEC	86	45	NONE	NONE	NONE	-
P.O. Box 665				-	-	-	-
Wilmington, CA 90748				-	-		-

LIST OF CLOSED SHIPYARDS (1980 - 1988)

NAME	CLOSED	JOBS	FACILITIES			REMARKS
	Mon Yr	Max Prv 3	Build Pos	Dock Pos	L-Pier T-Pier	Comments/Information
Dravo Corporation 4800 Grand Avenue Pittsburgh, PA 15225	APR 84	1550	W600-X W300-6 W300-5	M300 - -	350 650	Had 12 - 600 ft. ways Company still exists; no shipwork.
Dredgemaster International Co. - Hendersonville, TN	SEP 84	0	- - -	- - -	- -	- - -
Florida Ship Repair, Inc. 1825 Knox Road Tampa, FL 33605	- -	0	NONE - -	NONE - -	NONE -	- - -
Florida Ship, Inc. 2215 N.W. 14th Street Miami, FL 33125	- 84	0	NONE - -	F??? - -	- -	Had a 1000 ton cap. floating drydock. -
General Dynamics Corp. 97 East Howard Street Quincy, MA 02169	JUN 86	6000	G936 G860-2 G850-2	NONE - -	820 4530	Property is for sale. - -
Geosource, Inc. - Marine Div. 4040 Peters Road Harvey, LA 70059	AUG 84	50	NONE - -	M400 F195 F156	- -	Also had F138, F120, and F100. -
Golten Ship Repair, Inc. - Portland, ME	- -	18	NONE - -	NONE - -	NONE -	Had Navy MSR. - -
Guntert & Zimmerman, Inc. P.O. Box 1688 Stockton, CA 95201	- -	150	W400 - -	- - -	- -	- - -
Halter Marine, Inc. 19501 Chef Highway New Orleans, LA 70129	MAR 85	0	W194-3 W225-2 -	NONE - -	- -	Closed - lack of work Some property sold to Textron Marine Ind.
Halter Marine, Inc. P.O. Box 29266 New Orleans, LA 70189	MAR 85	48	W160 W110 -	NONE - -	NONE -	Sold to offshore sup. company in 1985; not used as a shipyard.

LIST OF CLOSED SHIPYARDS (1980 - 1988)

NAME	CLOSED	JOBS	FACILITIES			REMARKS
	Mon Yr	Max Prv 3	Build Pos	Dock Pos	L-Pier T-Pier	Comments/Information
Halter Marine, Inc.	AUG 86	1200	V500	F220	650	Placed in a care and
P.O. Box 11338			V150	-	1200	maintenance status in
Chickasaw, AL 36611			-	-		August 1986.
Halter Marine, Inc.	AUG 86	400	V210	NONE	230	Placed in a care and
P.O. Box 278			V210	-	920	maintenance status in
Lockport, LA 70182			V210	-		August 1986.
Halter Marine, Inc.	AUG 86	630	V350	NONE	260	Placed in a care and
Highway 21			V200	-	460	maintenance status in
Madisonville, LA 70447			V200	-		August 1986.
Hawaiian Tuna Packers	JUN 86	419	NONE	NONE	220	Company in business,
P.O. Box 238			-	-	220	does no more repairs
Honolulu, HI 96809			-	-		to ships or boats.
Hidden Harbor Boat Works, Inc.	- 85	42	NONE	NONE	NONE	Small boat builder
6111 East 21st Street			-	-	-	only.
Bradenton, FL 34203			-	-		-
Hoboken Shipyards, Inc.	JAN 87	351	NONE	G1064	1200	Had Navy MSR
Military Ocean Term., Bldg.100			-	-	1900	& MARAD MLSR.
Bayonne, NJ 07002			-	-		-
Hoffert Marine, Inc.	- 87	90	NONE	NONE	NONE	In bankruptcy.
1700 E. Church Street			-	-	-	Had MARAD MLSR.
Jacksonville, FL 32202			-	-		-
Horne Brothers, Inc.	DEC 83	414	NONE	NONE	665	Sold - some property
2408 Harbor Road			-	-	1256	bought by Newport
Newport News, VA 23607			-	-		News Shipbldg & DD Co
Hudson Engineering Company	- 85	141	NONE	NONE	NONE	-
520 York Street			-	-	-	-
Elizabeth, NJ 07201			-	-		-
Hudson Shipbuilders, Inc.	APR 85	624	V235-2	NONE	300	-
P.O. Box Q			V130-2	-	580	-
Pascagoula, MS 39567			V185	-		-

LIST OF CLOSED SHIPYARDS (1980 - 1988)

NAME	CLOSED	JOBS	FACILITIES			REMARKS
	Mon Yr	Max Prv 3	Build Pos	Dock Pos	L-Pier T-Pier	Comments/Information
Hunt's Steelship, Inc. Route #4, Box 76 Pine Bluff, AR 71602	JUN 86	0	V120 - -	NONE - -	110 140	Had only 12 employees in July 1985. -
Ingalls Marine, Inc. P.O. Box 368 Decatur, AL 35602	- 83	90	NONE - -	G496 - -	500 500	In a care & maint. status. -
Inland Marine Constructors Inc P.O. Box 5516 Evansville, IL 47715	JUN 86	50	V200 - -	NONE - -	NONE -	All facilities and assets sold. -
International Shipbldg. Corp. P.O. Box 4278 Houma, LA 70361	- 87	25	V250 V150 -	NONE - -	250 700	- - -
Ira S. Bushey & Sons, Inc. - Brooklyn, NY	- 81	130	NONE - -	F455 F300 -	786 4086	- - -
Jeffboat, Inc. P.O. Box 610 Jeffersonville, IN 47130	JUL 86	871	V500 - -	F200 F200 -	2100 4980	In a care & maint. status. -
Kaiser Steel Corp. P.O. Box 390 Napa, CA 94559-0390	JUN 86	1696	NONE - -	G383 G300 G268-2	500 500	- - -
Levingston Shipbuilding Co. P.O. Box 968 Orange, TX 77631-0968	- 85	1450	V1100 V260-2 V180	NONE - -	520 1850	Been in a care and maintenance status since 1985.
Lockheed Shipbuilding Co. 2929 16th Avenue S.W. Seattle, WA 98134	MAY 87	3009	V690 V640 V640	F643 - -	610 3580	All equipment sold. Had Navy MSR & MARAD MLSR.
Lockport Marine Company 5555 N. Channel Ave., Bldg.#10 Portland, OR 97217	JUL 87	300	AVAIL - -	AVAIL - -	AVAIL -	Used facilities at the Portland Ship Reapir Yard.

LIST OF CLOSED SHIPYARDS (1980 - 1988)

NAME	CLOSED		JOBS	FACILITIES			REMARKS
	Mon	Yr	Max Prv 3	Build Pos	Dock Pos	L-Pier T-Pier	Comments/Information
Luther's Marine & Industrial	OCT	86	12	NONE	NONE	NONE	Survey form returned
3505 Franklin Street				-	-	-	Phone disconnected.
Chesapeake, VA 23324				-	-		-
Marine Concrete Structures Inc	JUN	85	0	NONE	G350	-	Yard located in Port
2030 St. Charles Avenue				-	-	-	Bienville, MS
New Orleans, LA 70130				-	-		-
Marine Ways Corporation	-	-	120	NONE	M???	-	Had a small Marine
P.O. Box 10464				-	-	-	Railway.
Portland, OR 97210				-	-		-
Maryland Shipbuilding & DD Co.	JUL	84	1737	W600	F775	987	Had Navy MSR. Used by
P.O. Box 537				-	F650-2	5106	Toyota Motors for
Baltimore, MD 21203				-	F200		import operations.
Matton Shipyard, Inc.	APR	83	80	W150	NONE	250	-
P.O. Box 645				-	-	375	-
Cohoes, NY 12047				-	-		-
Maxon Marine Industries, Inc.	FEB	86	105	W???	M???	-	Had 6 building ways &
P.O. Box 69				-	-	-	500 ton capacity
Tell City, IN 47586				-	-		marine railway.
McDermott Int'l	-	85	0	NONE	F160	-	-
P.O. Box 2249				-	-	-	-
Gulfport, MS 39503				-	-		-
McDermott Int'l	-	85	0	NONE	F180	-	-
P.O. Box 128				-	F160	-	-
New Iberia, LA 70560				-	-		-
Merritt Ship Repair Company	-	81	80	NONE	F320	600	-
-				-	-	1155	-
Oakland, CA				-	-		-
Misener Industries, Inc.	-	85	209	W600	F210	450	-
P.O. Box 13625				-	-	1350	-
Tampa, FL 33681				-	-		-

LIST OF CLOSED SHIPYARDS (1980 - 1988)

NAME	CLOSED		JOBS	FACILITIES			REMARKS
	Mon	Yr	Max Prv 3	Build Pos	Dock Pos	L-Pier T-Pier	Comments/Information
Munro Drydock, Inc.	DEC	84	78	-	-	-	All facilities sold.
1 Winnisimmit Street				-	-	-	Had Navy MSR.
Chelsea, MA 02150				-	-		-
Paducah Marine Ways, Inc.	JAN	84	0	NONE	F200	-	New const. equipt.
P.O. Box 2305				-	-	-	scrapped; repair
Paducah, KY 42001				-	-		equipt. sold.
Perry Shipbuilding Company	NOV	86	130	NONE	NONE	1000	Property sold to land
P.O. Box 1318				-	-	5300	developer on
Erie, PA 16512				-	-		17 Nov 86.
Port Richmond Shipyard	-	85	200	NONE	G744	1560	-
-				-	G583	2100	-
Richmond, CA				-	G571-3		-
River & Offshore Services	-	86	0	NONE	NONE	1200	Maintains layberths.
P.O. Box 474				-	-	2000	No longer does repair
Violet, LA 70092				-	-		work.
RMI, Inc.	OCT	86	250	NONE	NONE	NONE	Assets liquidated -
1313 W. 24th Street				-	-	-	Chapter 7 bankruptcy.
National City, CA 92050				-	-		Had Navy MSR.
Rumsey Marine & Drydock Co.	-	80	52	W200	F200	450	Formerly N. Carolina
Route 3, Box 6				-	-	900	Shipbldg. & DD Co.
Wilmington, NC 28405				-	-		-
Sea Motive Corporation	-	87	70	NONE	NONE	NONE	Survey form returned.
Radar Street, Bldg. 296				-	-	-	No phone listing.
Port Newark, NJ 07114				-	-		Had MARAD MLSR.
Sea-Tac Alaska Shipbldg. Corp.	-	83	76	W250	F215	175	-
1112 Alexander Avenue				W150	-	175	-
Tacoma, WA 98421				-	-		-
Sherman Shipyard, Inc.	-	-	20	NONE	NONE	NONE	-
-				-	-	-	-
Panama City, FL				-	-		-

LIST OF CLOSED SHIPYARDS (1980 - 1988)

NAME	CLOSED		JOBS	FACILITIES			REMARKS
			Max	Build	Dock	L-Pier	
	Mon	Yr	Prv 3	Pos	Pos	T-Pier	Comments/Information
Steamco Corporation	-	87	90	NONE	F250	650	No survey response.
172 Lynhurst Avenue				-	-	1950	Phone disconnected.
Staten Island, NY 10305				-	-		Had MARAD MLSR.
Teh Tung Steamship Company	MAY	84	30	NONE	F600	840	-
-				-	-	840	-
Orange, TX				-	-		-
Texas Gulfport Shipbuilding Co	JUN	85	200	V550	F325	590	Was a subsidiary of
P.O. Box D				V400	F325	1270	Levingston Ind.
Port Arthur, TX 77640				-	-		-
Texas Shipbuilding Company	-	80	204	V450	NONE	300	-
P.O. Box 24787				V265	-	525	-
Houston, TX 77013				-	-		-
Thomas Knutson Shipbldg. Corp.	-	-	35	V300	M???	128	Had Marine Railways
East Shore Road				-	M???	450	of 60 & 40 ton cap.
Halesite, NY 11743				-	-		Had Navy MSR.
Todd Shipyards Corp.- Alameda	-	83	550	NONE	F900	800	Todd moved to former
-				-	F523	2485	Beth Steel yard in
Alameda, CA				-	-		San Francisco.
Todd Shipyards Corp.- Houston	JUL	83	392	V500	F600	1844	Remains in a care and
P.O. Box 9666				-	-	3200	maintenance status.
Houston, TX 77015				-	-		-
Tracor Marine Inc.	MAR	87	280	NONE	S360	780	Had Navy MSR.
P.O. Box 13107 Everglades Sta.				-	F300	1305	-
Fort Lauderdale, FL 33316				-	F270		-
Trans Ocean Shipyard	-	-	0	NONE	NONE	70	-
P.O. Box 4197				-	-	140	-
Brownsville, TX 78520				-	-		-
Triple A South	OCT	86	400	NONE	F389	NONE	Equipt. transferred
3350 Main Street				-	-	-	to San Fran facility,
San Diego, CA 92113				-	-		In care and maint.

LIST OF CLOSED SHIPYARDS (1980 - 1988)

NAME	CLOSED	JOBS	FACILITIES			REMARKS
	Mon Yr	Max Prv 3	Build Pos	Dock Pos	L-Pier T-Pier	Comments/Information
Twin City Shipyard, Inc.	MAY 86	130	W300	M225	1200	-
P.O. Box 43632			-	F100	1650	-
St. Paul, MN 55164			-	-		-
Weaver Shipyards	JUN 86	30	W200-5	M200	220	-
P.O. Box 1487			W200-5	M180	730	-
Orange, TX 77630			-	F180		-
Wellcraft Marine	- 88	1450	NONE	NONE	NONE	Company in business
8151 Bradenton Road			-	-	-	builds pleasure craft
Sarasota, FL 34243			-	-		only.
West Winds, Inc.	- 87	136	NONE	NONE	NONE	No survey response.
178 Townsend Street			-	-	-	Phone disconnected.
San Francisco, CA 94107			-	-		-
Wiley Mfg. Co.- Equip.Sys.Div.	SEP 84	526	W390	NONE	NONE	-
P.O. Box 97			W340	-	-	-
Port Deposit, MD 21904			-	-		-
Willamette Iron & Steel Co.	- 81	430	NONE	F1000	1200	-
2800 N.W. Front Avenue			-	F763	1200	-
Portland, OR 97210			-	F550-2		-
Williams & Manchester Shipyard	JUN 88	30	NONE	M120	300	Property converting
Lee's Wharf			-	-	900	to condominiums.
Newport, RI 02840			-	-		-
Zidell Explorations, Inc.	AUG 84	0	NONE	NONE	NONE	Yard equipment
3121 S.W. Moody Avenue			-	-	-	for sale.
Portland, OR 97201			-	-		-

APPENDIX D-3

SEALIFT ENHANCEMENT FEATURES (SEF)

SEF	DESCRIPTION/STATUS	SHIPYARD MANDAYS REQUIRED TO INSTALL
SEASHEDS	Special purpose, open topped, 40-foot long, 24-foot wide structure with bi-panel, self-activated, work-through floor sections to provide temporary decks in container ships for outsized items. Shipboard work includes modifications to cell guide structures and installation of electrical receptacles. Being bought are 921 units (483 units delivered). Additional 438 units were to be bought in Fiscal Year 1988. Several ships modified to carry 55 units. All T-ACS have seashed capability.	800/ship
FLATRACKS	Flatracks can be used on any container ship, without any special treatment, to carry such oversized items as main battle tanks. No ship modifications are required. To date 358 units have been purchased. For Fiscal Year 1987, 690 units were planned, but none were purchased. An additional 1,008 units were scheduled to be purchased during Fiscal Year 1988.	N/A
LASH LIFT BEAMS	A modification to LASH ship cranes to permit the use of lift beams to handle landing craft and causeway sections. Three of 15 planned ships have this SEF. Plan is to purchase two beams each year, but no beams were purchased in Fiscal Year 1987 and none again in Fiscal Year 1988.	N/A
20-FOOT CONTAINER HARDPOINTS	The installation of hardpoints in large (40 and 45-foot) container cells to permit the carriage of 20-foot long containers. Installed as a National Defense Feature (NDF). Approximately 25 percent of newer container ship capacity in the holds can be used without modifying the ship.	2,000/ship

SEF	DESCRIPTION/STATUS	SHIPYARD MANDAYS REQUIRED TO INSTALL
ASTERN REFUELING	The installation of deck pads, piping modifications, manifolds, valves, and electrical power leads to permit the contingency installation of a reel-mounted astern refueling rig. Sixty-four units are on hand for NATO. Five MSC tankers have this feature installed. No future requirements except for MSC charters.	875/ship
ALONGSIDE REFUELING CONSOLE	The installation of a kingpost or tripod, or the modification of an existing hardpoint, to support a padeye plus a quick closing valve and quick disconnect fitting to permit a commercial tanker to receive from an Underway Replenishment (UNREP) rig or to pump its cargo to a Navy ship. Fourteen MSC and 75 U.S. flag commercial tankers have the capability. All future MSC charter tankers will have the feature.	1,000/ship
ALONGSIDE REFUELING DELIVERY	A modular, self-contained Underway Replenishment (UNREP) station featuring a Standard Tensioned Replenishment Alongside Method (STREAM) rig for delivery of POL to combatants. Two stations are required per ship. Six ship sets are planned to be purchased. Five ship sets are currently under contract. Three ship sets were to be delivered in Fiscal Year 1988 and the remaining sets in Fiscal Year 1989. Four interface structures have already been installed on two MSC chartered tankers. Installations started in Fiscal Year 1988.	6,000/ship
UNREP CARGO CONSOLE	Underway Replenishment (UNREP) and support equipment to transfer cargo using the Standard Tensioned Replenishment Alongside Method (STREAM) rig received from a Military Logistics Support Force (MLSF) ship. A total of nine ships were programmed, and all installations have been completed.	5,000/ship

SEF	DESCRIPTION/STATUS	SHIPYARD MANDAYS REQUIRED TO INSTALL
UNREP CARGO DELIVERY	A modular, self-contained Underway Replenishment (UNREP) station composed of a power module, equipment module, operators station, kingpost, and a Standard Tensioned Replenishment Alongside Method (STREAM) rig for cargo delivery. Two stations are required per ship. Inventory objective is 11 ship sets. Three ship sets have been ordered, one of which was delivered during Fiscal Year 1988, and the first ship installation is to start during Fiscal Year 1989.	6,000/ship
CONTAINER SHIP STRIKE-UP	A system to enable a container ship to stow, breakout, and transfer palletized cargo in the manner of a breakbulk ship. A research and development program only. Prototype developed, tested, and available for installation. No current plans for equipment purchase or ship installations.	TBD
COMMS UPGRADE	The installation or upgrade of the radio facilities on RRF ships to provide them with standard capabilities. Program continues as ships are added or upgraded into the RRF. All current RRF ships have had the upgrade installed.	160/ship
NBC WASHDOWN	A simple system of clips to hold and orient the ship's fire hose nozzles in order to wet down the topside area. Installed during regular RRF shipyard period.	6/ship
VEHICLE TIEDOWNS	The installation of tiedown points to secure deck-stowed cargo such as vehicles or aircraft. Fifteen ships were programmed to receive this feature; thirteen have been completed. The remaining two were planned for completion during Fiscal Year 1988.	400/ship
AFOE MOORING	The installation of stowage and handling features to transport and employ the Assault Follow-On Echelon (AFOE) mooring system (buoys, anchors, chains and fittings). The program has been canceled.	N/A

SEF	DESCRIPTION/STATUS	SHIPYARD MANDAYS REQUIRED TO INSTALL
LIGHTER STOWAGE	Reinforcement of the main deck and hatch covers and installation of padeyes to accept landing craft. Twelve ships have received this feature, completing the program.	800/ship
LIGHTER MOORING	Installation of recessed mooring bitts in the ship's side to moor lighters and small craft alongside for loading and unloading. Twenty-nine ships were to receive this feature. Sixteen have been completed. No more are planned, due to funding restrictions.	400/ship
CRANE ENHANCED CONTAINER SHIP	Shipboard modifications to support the operation of a crane on a nonself-sustaining container ship to provide a self-offload capability. Design developed. No plans for demonstration or installations.	N/A
VERTREP	The shipboard installation required to provide a modular vertical replenishment (helicopter) deck. Installation on UNREP ships. Two completed. One ship was receiving this feature during Fiscal Year 1988. No additional installations are planned.	3,000/ship
AMMO ISOLATION BULKHEAD	Installation of an additional bulkhead adjacent to the bulkheads of machinery spaces and uptakes, as required by law, to permit merchant ships to carry bulk military explosives. Installed on six ships. No additional installations planned.	1,000/ship

APPENDIX D-4

PROJECTED SHIPYARD WORKLOAD

METHODOLOGY:

Shipyard workloads (in man years) for 1987 and as projected for the years 1988 through the year 2000 were developed by the Commission staff from information supplied by government agencies, trade associations, and by the government agencies and private corporations that have responsibility for the maintenance, repair, and construction of ships, boats, dredges and other floating property. The government agencies surveyed provided, wherever possible, the Commission staff with their projections for the maintenance, repair, and construction of vessels under their cognizance through the year 2000.

The projections were derived from the following categories:

NAVY NEW CONSTRUCTION: Based on future Navy surface ship and submarine construction plans.

NAVY REPAIR-PUBLIC: All Navy ship and submarine conversion, modernization, maintenance, and repairs projected to be done in the eight Naval shipyards.

NAVY REPAIR-PRIVATE: All Navy ship and submarine conversion, modernization, maintenance, and repairs projected to be done in private United States shipyards.

MILITARY SEALIFT COMMAND: Projected modernization, maintenance, and repairs for ships (strategic sealift, naval fleet auxiliary force, special mission support, and miscellaneous service) operated by the Military Sealift Command.

COAST GUARD: Projected new construction, modernization, maintenance, and repair of all United States Coast Guard ships, boats, and craft.

MARITIME ADMINISTRATION: Based on projected Ready Reserve Force (RRF) and the National Defense Reserve Fleet (NDRF) maintenance and activations, and schoolship conversion, maintenance, and repair requirements under the cognizance of the Maritime Administration.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION: Projected new construction, service life extension upgrades, maintenance, and repairs for the research vessels of the National Oceanic and Atmospheric Administration fleet.

ARMY: Projected new construction, maintenance, and repairs for ships and craft under the cognizance of the Army Corps of Engineers.

AIR FORCE: Projected new construction, maintenance, and repairs for craft under Air Force cognizance.

OCEANGOING COMMERCIAL SHIPS: Based on industry predictions for construction and repair of oceangoing commercial ships.

COASTAL/INLAND VESSELS: Based on industry predictions for construction and repair of coastal and inland commercial vessels.

OTHER: Based on a predicted but undefined aggregate workload that consists of work performed in the construction and repair of boats and craft, non-marine work, and all other shipyard work not covered by the other categories above.

PROJECTED SHIPYARD WORKLOAD

(Man Years)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NAVY NEW CONSTRUCTION	49,000	47,400	43,900	43,500	43,000	43,300	42,500	43,000	43,000	43,000	43,000	43,000	43,000	43,000
NAVY REPAIR - PUBLIC	32,200	32,100	29,600	26,800	25,000	24,100	25,700	26,600	26,700	29,000	29,300	24,900	25,400	25,200
NAVY REPAIR - PRIVATE	19,300	19,500	16,900	16,800	17,800	19,300	19,400	20,800	20,600	19,800	19,600	21,100	20,000	20,000
MILITARY SEALIFT COMMAND	1,300	1,500	1,500	2,100	2,100	2,100	2,000	2,000	2,100	2,100	2,200	2,100	2,200	2,100
COAST GUARD	1,700	1,700	1,600	1,300	1,800	2,400	2,300	2,400	2,400	1,200	1,200	1,200	1,200	1,200
MARITIME ADMINISTRATION	500	500	650	600	650	650	700	700	700	700	700	700	700	700
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	150	150	175	600	1,300	1,100	1,000	650	600	750	1,200	650	650	100
ARMY	200	400	400	475	475	450	300	400	325	400	300	400	300	375
AIR FORCE	50	10	10	10	10	30	30	30	30	30	30	30	30	30
OCEANGOING COMMERCIAL SHIPS	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500	5,500
COASTAL/INLAND VESSELS	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
OTHER	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800
TOTAL WORKLOAD	137,700	136,200	128,035	125,485	125,435	126,730	127,230	129,880	129,755	130,280	130,830	127,380	126,780	126,005

APPENDIX E

STAFF PAPERS

APPENDIX E-1

UNITED STATES TRADE AND THE MERCHANT MARINE

BACKGROUND:

In their first report, the Commissioners found that:

> "Free trade" in reality does not exist today because of the prevalence of discrimination and protectionism in international commerce, sometimes involving our closest trading partners and sometimes in violation of the spirit and letter of existing agreements. The United States government has not done as much as it could to deal with that situation by efforts to provide American flag ship operators with free access to international markets through all means, including international negotiations.

The Commissioners developed that finding into several recommendations in their second report, seeking to fulfill two complementary goals:

> Since cargo is necessary to achieving and maintaining a healthy merchant marine, the government should act to provide United States flag ship operators with greater access to cargo in international markets and to encourage United States shippers to make greater use of United States ships for both imports and exports.

UNITED STATES GOVERNMENT ACTIONS:

In order to determine whether the United States government believed it was doing all that it could to promote the use of United States flag ships, the Commission staff queried those agencies in the federal government most involved in international trade negotiations and promotion of the United States flag fleet: the Departments of State, Commerce, and Treasury, the United States Trade Representative, the Maritime Administration, and the Federal Maritime Commission.

All the agencies responded to the Commission's inquiries and expressed general support for the United States flag merchant marine.

Responses to the Commission's specific questions are as follows:

Question 1: What problems are you encountering in combating trade discrimination, such as cultural bias and legal impediments? Can they be overcome by negotiations or are stronger measures needed, such as legislation aimed at the offending country?

The agencies responded by stating that problems in restrictive maritime practices stem primarily from foreign laws and regulations that result in practices designed to favor national carriers. Examples cited included cargo reservation; restrictions on intermodal operations; restrictions on access to port facilities; and ship chartering by state-owned bodies. The United States effort toward elimination of foreign discriminatory practices through negotiations and the use of trade sanctions, or the threat of their use, against offending trading partners has had recent successes, but is a slow, difficult, and politically sensitive process.

Question 2: How can the interests of United States flag ship operators be given more attention in trade negotiations?

The responses to the question reflected a unanimous belief that the interests of United States flag ship operators were and are being given a great deal of attention by the United States government, particularly through bilateral negotiations aimed at ending restrictive or discriminatory treatment by foreign countries.

In most cases, removal of trade restrictions is sought through diplomatic channels. If that avenue proves to be unsuccessful, resolution of issues is sought through bilateral negotiations. If bilateral efforts fail, redress may be sought by private companies or other federal agencies through the Federal Maritime Commission, which can impose sanctions.

In addition to bilateral discussions, the United States has participated in discussions with the Consultative Shipping Group, consisting of West European countries and Japan.

The government agencies queried by the Commission staff pointed out that, in some cases, United States flag ship operators do not want more attention paid to them in trade negotiations, which, as in the recent United States-Canada Free Trade Agreement, often involve or affect a large number of industries other than shipping. Maritime interests lobbied successfully to exclude waterborne transportation from the Agreement, believing that they would receive no meaningful gains and that they might lose current benefits, such as preferential treatment in gaining access to government cargo and exclusive rights to carry United States cargo and passengers between United States ports.

It was pointed out to the Commission that United States carriers have requested that restrictive shipping practices be addressed in current bilateral talks with Taiwan and Korea. Although United States carriers have not formally stated a position, the government agencies anticipate that United States carriers will desire a "low profile" in the "Uruguay Round" of the General Agreement on Tariffs and Trade negotiations.

Question 3: What actions are being taken to counter discrimination? Could you report on any recent progress, as in the apparently successful ongoing negotiations with Taiwan?

The government agencies were pleased to point out recent actions that demonstrated that the United States is actively pursuing the goal of fair trade. Using negotiations backed up by the implied threat of possible retaliatory measures, the United States made progress against several foreign trade restrictions that had impeded United States trade for several years in Japan, Taiwan, and South Korea.

In trade with Japan, United States flag ship operators have now gained opportunities to carry leaf tobacco to Japan and automobiles from Japan to the United States; United States intermodal shipping companies have obtained permission to transport certain high cubic capacity cargo containers through designated routes in Japan; and Japanese port authorities have reached a one-year agreement with Japanese labor unions to end the prohibition against working on Sundays.

In Taiwan, United States carriers will be permitted to operate dockside container freight stations as well as inland terminals and shipping agencies. Carriers also will be able to own dockside equipment, or rent it at reasonable rates, and will be able to operate feeder vessels jointly. In addition, discrimination against United States carriers in the allocation of berthing space and space in container yards has been ended.

In South Korea, United States carriers will be able to establish full service branch offices to handle their own sales, cargo booking, marketing, and contracting, and to conduct direct negotiations with railroads, warehouses, and maintenance and repair firms. South Korea also agreed to permit the establishment of a foreign shipowners' association.

Question 4: Could the United States expect retaliation from trading partners if it were to take action, such as legislation, to combat alleged unfair foreign trade practices, and if so, what type of retaliation might be encountered? Would the retaliation be "worth it" or would it be detrimental to future trade negotiations involving the merchant marine?

Although the government agencies queried believe that retaliation is a possibility whenever the United States fights against restrictive trade practices, they find it hard to predict what kind or what type of retaliation might be taken. So far, negotiations, backed up by existing retaliatory statutes, have provided federal agencies with the leverage needed to combat restrictive practices. The Federal Maritime Commission pointed out to the Commission that it has no evidence of later retaliation against United States carriers that have raised trade discrimination issues before it.

Question 5: How do you now encourage United States firms to use United States flag ships in exporting and importing cargo? What additional actions might you be able to take?

Respondents indicated that they encourage the use of United States flag ships by both United States and foreign shippers whenever the ships are available at competitive rates.

In particular, the Commerce Department pointed to its new export promotion program, "Export Now," which was launched by President Reagan and Secretary Verity on February 24, 1988, to encourage United States companies to take advantage of the current global economic climate, which makes exporting more profitable for United States firms.

"Export Now" is intended to be a partnership between government and private industry to make American firms, particularly those firms that may have dismissed the idea of exporting in the past, aware of the growing potential for exports by identifying overseas markets and assisting companies through seminars and workshops. By the end of 1988, over 500 presentations by speakers from private companies and trade specialists from the federal government will have been given throughout the United States.

The Commerce Department has also built a partnership within the federal government by establishing an Interagency Working Group to involve other government agencies in the "Export Now" program. The involvement of the Maritime Administration in the working group and trade seminars sponsored by the "Export Now" program will keep government agencies, as well as private industry, aware of the importance of using United States flag ships in exporting.

Except for the "Export Now" program, which is aimed primarily at manufactured goods, the government agencies queried did not advise the Commission of any new initiatives aimed at promoting the United States flag merchant marine.

LAWS AFFECTING FOREIGN TRADE RESTRICTIONS:

The statutory authority used to redress foreign trade restrictions is contained in Section 19 of the Merchant Marine Act of 1920, Sections 15 and 13 of the Shipping Act of 1984, Section 301 of the Trade Act of 1974, and the Foreign Shipping Practices Act of 1988 as contained in the Omnibus Trade and Competitiveness Act of 1988.

Section 19 of the Merchant Marine Act of 1920 authorizes the Federal Maritime Commission to make rules and regulations to respond to any unfavorable conditions that are found to arise from foreign laws or practices. A Section 19 action may be initiated by the Federal Maritime Commission or upon petition by United States carriers, shippers, or other United States government agencies. Section 19 proceedings may take the form of a proposed rule that is published in the Federal Register along with an invitation for comment prior to the rule becoming effective, thus providing interested parties with the opportunity to offer their views on the existence and effects of the alleged unfavorable conditions.

Section 15 of the Shipping Act of 1984 authorizes the Federal Maritime Commission to require United States carriers to furnish any information pertaining to their businesses. The Federal Maritime Commission has invoked Section 15 on several occasions to obtain information about foreign restrictive trade practices from United States carriers in order to determine the appropriateness of initiating a formal Section 19 proceeding.

Section 13 of the Shipping Act of 1984 authorizes the Federal Maritime Commission to impose penalties when a foreign carrier or government unduly impairs a United States flag vessel's access to trade. The Federal Maritime Commission has not had to invoke Section 13, nor have any United States carriers as yet requested Section 13 action.

In addition to those statutes, the President may challenge unfair trading practices under authority granted by Section 301 of the Trade Act of 1974. Under Section 301, the President is authorized to take all appropriate action, including retaliation, to obtain the removal of any foreign government's act, policy, or practice that violates an international agreement or is unjustifiable, unreasonable, or discriminatory, and burdens or restricts United States commerce. The statute permits the President to impose sanctions against the offending country in order to open markets to United States goods and services.

The Omnibus Trade and Competitiveness Act of 1988 (Public Law 100-418), signed by President Reagan on August 23, 1988, signals the intention of the United States to continue to protect its interests in the world trading market for the foreseeable future. The legislation, which Congress took four years to fashion, amounts to the most extensive revision of United States trade laws since World War II. It expands the definition of unfair trade practices that can trigger United States retaliation and requires the President to take aggressive action against unfair trade practices by other nations, although he may choose the form of retaliation, such as tariffs or quotas.

The Foreign Shipping Practices Act of 1988, as contained in the Omnibus Trade and Competitiveness Act, requires the Federal Maritime Commission to conduct investigations and, if necessary, to take actions against conditions that adversely affect the operations of United States carriers in United States oceanborne trade and that do not exist for foreign carriers in the United States. After determining that conditions adversely affecting United States oceanborne carriers exist, the Federal Maritime Commission may recommend actions, such as limitations on sailings and cargo carried to and from American ports, fines, and/or suspension of tariffs, to be taken against foreign carriers. The Foreign Shipping Practices Act authorizes the President to approve or disapprove the recommended action before it becomes effective. The actions against foreign carriers authorized by the Foreign Shipping Practices Act may also be used in the administration and enforcement of Section 13 of the Shipping Act of 1984 or of Section 19 of the Merchant Marine Act of 1920.

CONCLUSION:

Although trade discrimination problems continue to exist, progress has been made, and federal agencies appear to be actively addressing restrictive trade practices. Trade barriers may never be completely eliminated, but more open markets and a freer trade are achievable pursuits. Further progress toward the goal of fair trade can be made if the diligence and aggressive pursuit of trade discrimination that has been demonstrated in 1988 continues to be a characteristic of United States policy.

APPENDIX E-2

THE TAX REFORM ACT OF 1986 AND ITS EFFECT ON THE UNITED STATES MERCHANT MARINE

BACKGROUND:

On October 22, 1986, President Reagan signed into law the Tax Reform Act of 1986 (Public Law 99-514), which many people consider to be the most significant change in federal tax policy since passage of the Sixteenth Amendment to the Constitution in 1913 cleared the way for a federal income tax.

Over two years earlier, in his 1984 State of the Union address, President Reagan endorsed the need for tax reform. In response to tasking from the President, the Treasury Department prepared a report entitled *Tax Reform for Fairness, Simplicity, and Economic Growth* in November 1984. The Treasury report was followed by the White House proposal, *The President's Tax Proposals to the Congress for Fairness, Growth, and Simplicity*, which was submitted to Congress in May 1985.

In presenting the President's tax reform proposals to Congress, in testimony before the House Ways and Means Committee on May 30, 1985, then-Treasury Secretary James Baker summarized the need for tax reform:

> The average taxpayer has become convinced that others benefit from this growing complexity and that he or she does not. He or she understands very well that as long as the tax laws permit others to shelter income and thereby avoid paying a fair share of tax, then he or she must make up the difference by paying a greater share. Every new amendment to fine tune this . . . tax code serves only to worsen the public's perception of fairness. The time is right for starting anew with the fresh approach that fundamental reform offers.
>
> We cannot expect to succeed unless we all are convinced that there is a clear and compelling need for reform.
>
> We have only to listen to the ordinary taxpayer to learn that such a need does exist.

The President's proposals were followed by House and Senate versions of a tax reform package. The proposals were then incorporated into what became the Tax Reform Act of 1986 by the House-Senate Joint Committee on Taxation.

The motivating factors for the Tax Reform Act of 1986 can be summed up in three goals: fairness, efficiency or economic growth, and simplicity. The Act established two basic individual income tax rates -- 15 percent and 28 percent -- to replace the more than a dozen individual existing tax rates that had been set as high as 50 percent. The Act phased out some individual deductions, such as state sales taxes and interest on charge accounts, completely removed six million low-income individuals from the income tax rolls, and provided significant reductions in the tax burden on other working, low-income individuals.

To offset the reduced revenues from individual income taxes, corporate tax revenues were increased by $120 billion during Fiscal Years 1987 through 1991, even though corporate tax rates were reduced from a basic maximum rate of 46 percent to 34 percent, effective 1 July 1987. The increase in corporate tax revenues was achieved through broadening the tax base by limiting deductions, eliminating or restricting investment credits, and imposing a new Alternative Minimum Tax. In so doing, the 1986 Act shifted the income tax burden away from individuals and toward corporations.

TAX CHANGE PROVISIONS AFFECTING THE UNITED STATES MERCHANT MARINE INDUSTRIES:

The businesses and corporations of the United States merchant marine, like other United States corporate sectors, were affected by the revised tax rules. The provisions of the Tax Reform Act of 1986 that most affected the United States merchant marine are revision of the Accelerated Cost Recovery System (ACRS), lengthening of depreciation periods from 5 to 10 years, repeal of the Investment Tax Credit, application of the Alternative Minimum Tax rules, increased restrictions on foreign tax-credit rules, and revision of the meal deductibility rules.

Under pre-1986 tax law, vessels documented under the laws of the United States and operated in the foreign or domestic commerce of the United States, as well as cargo containers and other water transportation equipment, had qualified as 5-year Accelerated Cost Recovery System property. In addition, vessels and equipment had qualified for the Investment Tax Credit at the full 10 percent rate.

The Tax Reform Act of 1986 revised the Accelerated Cost Recovery System (ACRS) to create additional classes of depreciable property, to reclassify some property to new classes having a longer useful life, and to apply a more accelerated depreciation method to short-lived property. The Act also repealed the 10 percent Investment Tax Credit that had been applicable to all types of property, including maritime industry assets. The reasons given by Congress for the changes are provided as Exhibit A at the conclusion of this Appendix.

These changes affected the depreciable life of shipping assets. For example, cargo containers generally remain 5-year property. Ships, however, are now 10-year property and are to be depreciated using a 200 percent straight-line method. Other water transportation equipment is generally 15-year property and is to be depreciated using a 150 percent straight-line method.

Another provision of the Tax Reform Act, the Alternative Minimum Tax (AMT), was enacted to ensure that all corporations earning a minimum income for financial reporting purposes would pay some tax. The reasons for the enactment given by Congress are found in Exhibit B at the end of this Appendix.

As described by Thomas Horst and William Cline in their study for the Coalition of Service Industries, The Impact of the Tax Reform Act of 1986 on the International Competitiveness of Service Industries:

> The AMT generally equals 20 percent of alternative minimum taxable income, which is calculated by restating regular taxable income (taking account of new base-broadening rules) to include certain AMT adjustments and preferences and then adding 50 percent of any remaining difference between tentative AMT income and adjusted book income. For example, AMT taxable income is adjusted by the amount of the difference between regular depreciation and less accelerated "alternative" depreciation. Up to 90 percent of the AMT can generally be offset by the foreign tax credit, but not by other tax credits (a limited exception is available for the investment credit claimed with respect to "transition" property or carried over from years prior to 1986).

The provision affects the United States merchant marine because AMT income includes amounts contributed to, and earnings on, the merchant marine Capital Construction Fund (CCF). The objective of the Capital Construction Fund program is to lower the cost of capital for United States carriers, making their costs more competitive with the capital costs incurred by foreign carriers whose home countries permit the accumulation of capital on a pre-tax basis or which otherwise subsidize their national merchant marine industries.

Payments of federal income taxes on deposits and earnings to the CCF are deferred if and until such funds are withdrawn for nonqualified purposes or because of termination of the agreement. If withdrawn for qualified purposes (acquisition of vessels or retirement of debt on vessels), the funds become tax deferred and the federal income tax basis of any ship is reduced by the amount of such withdrawals. Under the Tax Reform Act of 1986 (effective

January 1, 1987), the CCF remains as a tax deferral device, but the taxpayer must develop program objectives within three years or treat the excess as a nonqualified withdrawal. A 25-year time limit was established as the maximum period that money can remain tax deferred in the fund. The reasons given by Congress for the changes to the tax deferral provisions under the CCF are given in Exhibit C at the end of this Appendix.

Several provisions of the Tax Reform Act of 1986 affected foreign subsidiaries of United States companies. Many United States maritime companies operate foreign flag ships through foreign subsidiaries. Under pre-1986 tax law, shipping income derived from these sources could be deferred under Subpart F by reinvesting the profits in shipping assets.

The 1986 Act made four major changes to the Subpart F provision:

-- United States taxes on shipping income earned through controlled foreign corporations can no longer be deferred by reinvesting those earnings in qualified shipping assets.

-- The rule for determining whether income is from a foreign or domestic source was changed from one based on the number of days a ship spent within United States territorial waters or according to where expenses were sourced, to one under which 50 percent of the income from transportation to or from the United States is considered a United States source, effectively increasing the portion of total income that is considered to be from a domestic source and reducing that which is considered to be from a foreign source. Prior to the Tax Reform Act, income earned by foreign subsidiaries of United States corporations generally was not taxed until dividends were remitted to United States shareholders.

-- The foreign tax credit limitation is now to be applied separately to ocean shipping and other transportation income, thereby eliminating the ability of United States corporations to apply excess foreign taxes from other foreign activities against United States tax on transportation income.

-- The amount of interest expense that must be apportioned among various categories of foreign source income is increased by the expense allocation rules.

In addition, the Tax Reform Act disallowed pre-1987 foreign shipping loss carry-forwards by eliminating the deduction of ordinary and necessary business expenses associated with foreign shipping operations. The reasons given by Congress for the changes made to Subpart F are given in Exhibit D at the end of this Appendix.

One other provision of the Tax Reform Act that affected the merchant marine reduced the deduction available to employers for the cost of meals provided to employees, to include the deduction available to ship owners and operators for the cost of meals provided to merchant seamen, from 100 to 80 percent. The proposed Technical Corrections Act of 1988 would restore the full deductibility for meals, including meals provided to merchant seaman. The reasons given by Congress for the meal charge provisions in the Tax Reform Act of 1986 are given in Exhibit E at the end of this Appendix.

DISCUSSION:

In determining the possible effects of the provisions of the Tax Reform Act of 1986 on the United States merchant marine, the Commission staff reviewed several recent studies sponsored by the Coalition of Service Industries (CSI), the Treasury Department, and private tax organizations. In addition, inquiries were sent to the American Institute of Merchant Shipping (AIMS), the Federation of American Controlled Shipping (FACS), the United Shipowners of America (USA), and the Shipbuilders Council of America (SCA). Information was also provided from public testimony before the Commission on Merchant Marine and Defense.

The Coalition of Service Industries (CSI) study examined five service sectors: advertising, commercial banking, investment banking, insurance, and ocean shipping. Using detailed cost models, the CSI study found that changes made under the Tax Reform Act of 1986 may negatively affect the international competitiveness of the sectors examined, and estimated that overall service exports may be reduced by a total of $1.7 billion annually for the five service sectors examined.

Although the study points out that the Tax Reform Act of 1986 affected the various service sectors differently, particularly hard hit were both the United States flag and foreign subsidiaries of United States ocean shipping corporations. The study estimates that, in order to maintain pre-1986 rates of return on investments, United States flag ship carriers would have to raise shipping rates 12 percent. Price increases of that magnitude would probably result in a reduction of activity because of the degree of foreign shipping competition and the sensitivity of shipping markets to rate changes. The CSI study further estimates that a decrease in activity because of a 12 percent price increase could result in a 36 percent reduction in overall merchant shipping revenues, amounting to $1.3 billion annually. According to the study, up to 23,000 maritime-related jobs could be lost as a result of the reduction.

The CSI study also estimates that the repeal of the Subpart F exclusion for reinvested shipping profits into shipping assets will result in a tax burden increase that will require a 4 percent increase in shipping rates by the foreign subsidiaries of

United States shipping corporations to maintain pre-1986 rates of return. The price increase could, according to the study, result in a 12 percent reduction in foreign shipping affiliate revenue, amounting to $1.1 billion per year.

The CSI study concludes that the Tax Reform Act imposed new obstacles to United States international competitiveness. Although the United States corporate tax rate moved from the higher to the lower end of the international corporate tax spectrum, the base-broadening provisions of the Tax Reform Act have generally not been adopted outside the United States. The study states that, even if other countries were to copy the United States tax system, United States based companies would continue to be competitively disadvantaged as long as the United States treatment of foreign income is more restrictive than that of other countries.

Another study, Corporations' "Fair Share" of Federal Taxes, sponsored by the National Chamber Foundation, an affiliate of the United States Chamber of Commerce, does not discuss the merchant marine as a separate category. Nonetheless, the study finds that United States capital intensive industries are disadvantaged by the Tax Reform Act:

> By buying off on the unfounded charge that corporations were shirking their taxpaying responsibilities, tax policy-makers felt free to increase corporate tax liabilities enormously, without telling the public that they were really increasing the tax bills of virtually every individual in the nation.
>
> Tax policy-makers also fell victim to the fair-share blather about "good-citizen" versus corporate tax-dodgers. At a time when the competitive position of U.S. businesses in the world marketplace and the balance of trade were seen as the nation's most urgent economic problems, tax "reforms" increased the tax load on many of the U.S. businesses that account for a substantial part of American exports.
>
> The consequence is an income tax law that exacerbates the distortion of resource allocation between incorporated and unincorporated businesses, escalates the cost of capital, particularly for capital-intensive industrial businesses, impairs the competitive position of American businesses in the world marketplace, and erects additional tax barriers to the efficient functioning of the U.S. economy.

Three studies prepared under the auspices of the Treasury Department look at the effect of the Tax Reform Act of 1986 on the economy. The studies use computer-generated models to reach their conclusions. Perhaps unsurprisingly, in contrast to the two privately-sponsored studies, the Treasury studies find the effect of the Tax Reform Act on the economy to be less dramatic.

Investment Incentives Under the Tax Reform Act of 1986 finds that tax reform generally reduces investment incentives but has succeeded in "leveling the playing field." The results of the study suggest:

> . . . that tax reform will cause a slight increase in effective tax rates. However, due in large part to Investment Tax Credit repeal and corporate rate reduction, the relative tax treatment of different assets and investors is improved. Thus, a more efficient allocation of investment is likely to result.

A second study sponsored by the Treasury Department, Investment Allocation and Growth Under the Tax Reform Act of 1986, concentrates on provisions that would affect taxes on income from capital. The study finds that:

> . . . reform of capital taxation results in net improvements in [corporate] welfare. This result holds even though in many instances both output and capital formation fall slightly as a result of tax reform. The provisions of tax reform that affect capital tend to stimulate production in industries such as agriculture that employ large amounts of nondepreciable assets fully benefiting from statutory rate reduction.

Finally, a study entitled The Impact of the Tax Reform Act of 1986 on Trade and Capital Flows evaluates the international implications of tax reform on both trade and international capital flows. The study finds that the Tax Reform Act has had a relatively small overall effect on trade:

> It does not have a dramatic effect on relative costs among sectors and, in the long run, there is only a modest change in the trade balance. There is a decrease in the trade deficit in the short run because of the capital outflow in response to lower after-tax returns in the United States. In the long run, there is a small ($1 to 2 billion) increased trade deficit because increased stock of U.S.-owned capital abroad generates greater investment income and finances more imports.

In addition to reviewing studies concerned with the Tax Reform Act of 1986, the Commission staff reviewed responses received from several merchant marine related organizations that had been asked what effect the Tax Reform Act had had on their members. There was a consensus among the organizations that the lengthening of depreciation periods and repeal of the Investment Tax Credit, application of the Alternative Minimum Tax rules to the Capital Construction Fund, and repeal of the Subpart F foreign income deduction provisions have hindered, rather than helped, the United States merchant marine.

In his response to the Commission, Mr. Ernest Corrado, President, American Institute of Merchant Shipping (AIMS), indicated his organization's support of the Coalition of Service Industries (CSI) study and discussed the effect of the Tax Reform Act on AIMS members, stating:

> The tax policy of the United States, and in particular the Tax Reform Act of 1986, severely effects the competitiveness of the U.S.-flag maritime industry. Tax burdens on the U.S. maritime industry contribute to our difficulty in competing with foreign-flag carriers that generally face few, if any, taxes on ocean shipping. Furthermore, tax burdens on domestic carriers make shipping more expensive and reduce the ability of our domestic carriers to compete with alternative modes of transportation.

The theme of impaired international competitiveness was also discussed by Mr. Philip Loree, Chairman, Federation of American Controlled Shipping (FACS), in testimony before the Commission on Merchant Marine and Defense on May 24, 1988. Mr. Loree stated, in part:

> . . . if you travel around the world and talk to foreign [ship] owners, you find that they are enjoying the benefits of either an untaxed or tax deferred system on their income.
>
> . . . the EUSC ["Effective U.S. Controlled"] fleet is suffering now from a disease that is totally manmade because of the 1986 Tax Reform Act. . . .
>
> . . . we are going to find it impossible to compete cost-wise with foreign competitors, all of whom are tax deferred or untaxed, because the net cost of any new vessel is going to be 50 percent higher. . . . In a capital intensive business that is the end.

> What is equally dismaying is the encouragement this new law gives to U.S. companies to shift more than 50 percent control to foreign joint ventures.
>
> . . . Also -- and I think this point is so often missed -- the new law is going to reduce, rather than increase, the number of ships flying the United States flag.

The response from Mr. William Verdon, President, United Shipowners of America (USA), discussed the reduced international competitiveness for the United States flag merchant marine, a consequence of the Tax Reform Act of 1986 that was also cited by the other associations. Mr. Verdon stated in part:

> The ability of U.S.-flag shipping companies to compete in the international shipping market and, ultimately, to exist at all, depends entirely on the ability of those U.S. carriers to match their foreign competitors' cost of doing business. An integral component of the cost of doing business is the impact of tax burdens.
>
> The foreign competitors of U.S. shipping companies pay little or no tax to their home countries. To contend that U.S. international shipping companies should be taxed in the same manner as domestic U.S. companies is to conclude, quite simply, that U.S.-flag shipping companies in the international trades should not exist at all.
>
> . . . in the Tax Reform Act of 1986 . . . certain favorable tax provisions were removed with no reflection upon, and in spite of, that same international reality.
>
> Other than the United States, no other country has adopted measures making the conduct of a shipping business by their own flag lines substantially more expensive than it has previously been, and no country is expected to do so.

In his response, Mr. John Stocker, President, Shipbuilders Council of America, could not quantify the effects of the Tax Reform Act on his organization's members. He stated a belief, however, that the Tax Reform Act will have a negative effect on shipyards, citing provisions such as elimination of the Investment Tax Credit and the lengthening of the period for depreciating assets as having had a negative effect on capital formation -- a necessary ingredient for a shipyard to "become competitive and remain so."

CONCLUSION:

Although the Tax Reform Act of 1986 has been in effect for two years, the debate continues as to whether it has achieved its stated goals of fairness, economic growth, and simplicity. At this still early date, the effect of the Act on the economy is ambiguous: Different sectors of the economy are affected differently by the provisions of the Act.

The consensus, however, is that corporations in capital-intensive industries, especially United States corporations involved in international commerce and United States corporations with foreign subsidiaries, have been particularly hard hit by the Tax Reform Act. Since the United States merchant marine is a capital-intensive industry involved in international commerce, with many of its companies operating foreign subsidiaries, the Tax Reform Act can therefore be said to have had a negative effect on the United States merchant marine.

For the United States government to promote the international competitiveness of the country's private corporations, just as other countries do, would benefit the entire economy. The United States now has an Omnibus Trade and Competitiveness Act, the purpose of which is to create a coordinated trade policy and to combat foreign discriminatory trade practices. A similar consideration in tax policy would permit United States corporations effectively to compete with their foreign competitors who, obviously, do not have to abide by United States tax laws. Trade gains made at the negotiating table for United States corporations, if complemented by tax laws that encouraged corporate growth and competitiveness in domestic and international markets, would consolidate and expand on the gains already made. Other countries use tax concessions to encourage corporate growth, and the United States might benefit from this internationally accepted practice.

EXHIBITS

NOTE: All exhibits are taken from General Explanation of the Tax Reform Act of 1986 (H.R. 3838, 99th Congress; Public Law 99-514), Joint Committee on Taxation, United States Congress, United States Government Printing Office, Washington, D.C., 1986.

EXHIBIT A:

TITLE II - PROVISIONS RELATING TO CAPITAL COST

Subtitle A - Depreciation Provisions (Sections 201 through 203)

Subtitle B - Repeal of Regular Investment Tax Credit (Section 211)

Reasons for Change:

> ACRS [Accelerated Cost Recovery System] provides a small number of depreciation classes and relatively short recovery periods. The Congress chose to maintain this structure, while adopting improvements. For example, the Congress believed ACRS could be made more neutral by increasing the recovery period for certain long-lived equipment, and by extending the recovery period of real property.
>
> The Congress concluded that some further acceleration in the rate of recovery of depreciation deductions should be provided to compensate partly for the repeal of the investment tax credit. The Act increases the rate of acceleration from 150-percent declining balance to 200-percent declining balance for property in the 3-year, 5-year, 7-year, and 10-year classes. Together with the large tax rate reductions, investment incentives will remain high and the nation's savings can be utilized more efficiently. An efficient capital cost recovery system is essential to maintaining U.S. economic growth. As the world economies become increasingly competitive, it is most important that investment in our capital stock be determined by market forces rather than by tax considerations.
>
> Under prior law, the tax benefits of the combination of the investment tax credit and accelerated depreciation were more generous for some equipment than if the full cost of the investment were deducted immediately -- a result more generous than exempting all earnings on the investment from taxation. At the same time, assets not qualifying for the investment credit and accelerated depreciation bore much higher effective tax rates. The output attainable from our capital resources was reduced

because too much investment occurred in tax-favored sectors and too little investment occurred in sectors that were more productive but which were tax-disadvantaged. The nation's output can be increased simply by a reallocation of investment, without requiring additional saving.

The Congress concluded that the surest way of encouraging the efficient allocation of all resources and the greatest possible economic growth was by reducing statutory tax rates. A large reduction in the top corporate tax rate was achieved by repealing the investment tax credit without reducing the corporate tax revenues collected. One distorting tax provision was replaced by lower tax rates that provide benefits to all investment. A neutral tax system allows the economy to most quickly adapt to changing economic needs.

EXHIBIT B:

TITLE VII - ALTERNATIVE MINIMUM TAX (Sections 701-702)

Reasons for Change:

Congress concluded that the minimum tax should serve one overriding objective: to ensure that no taxpayer with substantial economic income can avoid significant tax liability by using exclusions, deductions, and credits. Although these provisions may provide incentives for worthy goals, they become counterproductive when taxpayers are allowed to use them to avoid virtually all tax liability. The ability of high-income taxpayers to pay little or no tax undermines respect for the entire tax system and, thus, for the incentive provisions themselves. In addition, even aside from public perceptions, Congress concluded that it is inherently unfair for high-income taxpayers to pay little or no tax due to their ability to utilize tax preferences.

Congress viewed the minimum taxes under prior law as not adequately addressing the problem, principally for two reasons. First, the corporate minimum tax, as an add-on rather than an alternative tax, was not designed to define a comprehensive income base. Second, the prior law minimum taxes did not sufficiently approach the measurement of economic income. By leaving out many important tax preferences, or defining preferences overly narrowly, the individual and corporate minimum taxes permitted some taxpayers with substantial economic incomes to report little or no minimum taxable income and thus to avoid all liability.

> In addition, Congress concluded that certain items, not presently treated as preferences, must be added to the minimum tax base in order for it to serve its intended purpose of requiring taxpayers with substantial economic incomes to pay some tax. The items as to which Congress reached this determination include tax-exempt interest on newly issued private activity bonds . . . use of the completed contract method of accounting, untaxed appreciation deducted with respect to charitable contributions of appreciated property, use of the installment method by certain taxpayers, and the use of tax-favored capital construction funds by shipping companies.

EXHIBIT C:

TITLE II - PROVISIONS RELATING TO CAPITAL COST

Subtitle G - Merchant Marine Capital Construction Fund (Section 261)

Reasons for Change:

> The Congress concluded that the provision of tax benefits for U.S. shipping through the Capital Construction Fund mechanism is appropriate. Aid to U.S. shipping industries is necessary to assure an adequate supply of ships in the event of war. The Congress has adhered to a policy of providing tax incentives to the domestic shipping industry for many years, and there was a concern that the elimination of such incentives, coupled with reduced appropriations for maritime construction, could injure the industry.
>
> The incentive under prior law may not have functioned properly as an incentive for U.S. shipbuilding. Consequently, the Congress determined that additional requirements should be imposed to insure that capital construction funds are used for the intended purpose. The Congress was also concerned about the ability of taxpayers to avoid taxation on nonqualified withdrawals by making such withdrawals in years for which there are net operating losses (or other tax attributes that reduce the tax attributable to the withdrawal).
>
> The Congress became aware during its tax reform hearings that Treasury's proposal to terminate the Capital Construction Fund (CCF) could have a serious adverse impact on the financial reporting requirements of CCF holders. The Congress did not intend that the modifications to the CCF program be viewed as requiring any change in the financial statement presentation of

income taxes by CCF holders. These taxpayers should be allowed to provide future financial statements necessary for ship financing on a basis consistent with that anticipated at the time these taxpayers entered into CCF agreements with the Federal government.

EXHIBIT D:

TITLE XII - FOREIGN TAX PROVISIONS

Subtitle A - Foreign Tax Credit Modification (Sections 1201-1205)

Subtitle B - Source Rules (Section 1212)

Subtitle C - Taxation of Income Earned Through Foreign Corporations (Section 1221)

Reasons for Change:

Congress understood that shipping income frequently is not taxed by any foreign country or is subject to very limited foreign tax. Under the overall limitation of prior law, U.S. multinational entities with excess foreign tax credits from other business activities could earn such shipping income free of U.S. tax as well: their excess credits could shelter the shipping income from U.S. tax.

Under prior law, a very small portion of income earned from transporting persons and cargo from the United States to a foreign country was U.S. source. Congress believed that the U.S. source portion of this income generally should be greater than the amount determined under prior law. Consistent with its general reevaluation of prior law's source rules, Congress generally did not believe that U.S. persons should be allowed to generate foreign source income (or loss) unless the income (or loss) is generated within a foreign country's tax jurisdiction and subject to foreign tax. Congress believed that the United States has the right to assert primary tax jurisdiction over income earned by its residents that is not within any other country's tax jurisdiction. (Prior law's treatment of this income as foreign source had the effect of relinquishing primary tax jurisdiction over a substantial amount of this income.)

The operation of prior law had two undesirable effects. First, for U.S. persons, income that did not have a nexus with any foreign country and was only partially, if at all, subject to foreign tax inappropriately increased the foreign tax credit limitation of the taxpayer. (Conversely, losses treated as foreign source reduced the taxpayer's foreign tax credit limitation despite the absence of a nexus with a foreign country.) A taxpayer with excess foreign tax credits from unrelated foreign operations then was allowed, by characterization of income as foreign rather than U.S. source, to offset all or part of any U.S. tax that otherwise would have been imposed on this income. Thus, a profitable taxpayer with excess foreign tax credits had a competitive advantage over a taxpayer who did not have excess foreign tax credits. Second, prior law's understatement of U.S. source income tended to subject foreign persons to too little U.S. tax. In Congress' view, prior law did not allow the United States to assert proper tax jurisdiction.

Shipping Income:

Foreign base company income subject to current taxation under subpart F did not, under prior law, include foreign base company shipping income that was reinvested in foreign base company shipping operations. Congress did not believe that this reinvestment exclusion was appropriate as a matter of tax policy. Nowhere else in subpart F is such an exception granted; in all other cases, if tainted income is earned through a controlled foreign corporation, then current taxation under Subpart F results, regardless of the use to which the income is put. Congress previously made a judgment that shipping income is the type of income rarely subjected to foreign tax that ought to be subject to subpart F when earned through a foreign corporation. Congress decided that as a matter of tax policy that judgment should be given full effect. Because shipping income is seldom taxed by foreign countries, earning such income through a foreign corporation could effectively exempt it from all current tax, U.S. and foreign. The prior exclusion thus served to promote U.S. investment in foreign-flag shipping operations by providing U.S. tax benefits to such investment. Congress questioned whether it was fully in the interests of the United States to promote U.S. investment in the shipping activities of other nations.

EXHIBIT E:

TITLE I - INDIVIDUAL INCOME TAX PROVISIONS

Subtitle E - Expenses for Business or Investment (Section 142)

Reasons for Change:

Since the 1960's the Congress has sought to address various aspects of deductions for meals, entertainment, and travel expenses that the Congress and the public have viewed as unfairly benefiting those taxpayers who are able to take advantage of the tax benefit of deductibility. In his 1961 Tax Message, President Kennedy reported that "too many firms and individuals have devised means of deducting too many personal living expenses as business expenses, thereby charging a large part of their cost to the Federal Government." He stated: "This is a matter of national concern, affecting not only our public revenues, our sense of fairness, and our respect for the tax system, but our moral and business practices as well."

After careful review during consideration of the Act, the Congress concluded that these concerns were not addressed adequately by prior law.

The Congress believed that prior law, by not focusing sufficiently on the personal-consumption element of deductible meal and entertainment expenses, unfairly permitted taxpayers who could arrange business settings for personal consumption to receive, in effect, a Federal tax subsidy for such consumption that was not available to other taxpayers . . . Polls indicated that the public identified the full deductibility of normal personal expenses such as meals and entertainment tickets to be one of the most significant elements of disrespect for and dissatisfaction with the tax system.

In light of these considerations, the Act generally reduces to 80 percent the amount of otherwise allowable deductions for business meals, including meals while on a business trip away from home, meals furnished on an employer's premises to its employees, and meal expense at a business luncheon club or a convention, and business entertainment expenses, including sports and theatre tickets and club dues. This reduction rule reflects the fact that all meals and entertainment inherently involve an element of personal living expenses, but still allows an 80-percent deduction where such expenses also have an identifiable business relationship. The Act also tightens the requirements for establishing a bona fide business reason for claiming food and beverage expenses as deductions. The Act includes specified exceptions to the general percentage reduction rule.

In certain respects, more liberal deduction rules were provided under prior law with respect to business meals than other entertainment expenses, both as to the underlying legal requirements for deductibility and as to substantiation requirements. The Congress concluded that more uniform deduction rules should apply; thus, deductions for meals are subject to the same business-connection requirement as applies for deducting other entertainment expenses.

BIBLIOGRAPHY

Corrado, Ernest J., President, American Institute of Merchant Shipping, Washington, D.C., letter, June 22, 1988.

Fullerton, Don, Robert Gillette, and James Mackie, "Investment Incentives Under the Tax Reform Act of 1986," Compendium of Tax Research 1987, Office of Tax Analysis, Department of the Treasury, U.S. Government Printing Office, Washington, D.C., pp. 131-169.

Fullerton, Don, Yolanda K. Henderson, and James Mackie, "Investment Allocation and Growth Under the Tax Reform Act of 1986," Compendium of Tax Research 1987, Office of Tax Analysis, Department of the Treasury, U.S. Government Printing Office, Washington, D.C., pp. 173-202.

Grubert, Harry, and John Mutti, "The Impact of the Tax Reform Act of 1986 on Trade and Capital Flows," Compendium of Tax Research 1987, Office of Tax Analysis, Department of the Treasury, U.S. Government Printing Office, Washington, D.C., pp. 229-254.

Horst, Thomas, and William R. Cline, "The Impact of the Tax Reform Act of 1986 on the International Competitiveness of Service Industries," Coalition of Service Industries, Inc., Washington, D.C.

Loree, Philip, Chairman, Federation of American Controlled Shipping, New York, statement before the Commission on Merchant Marine and Defense, May 24, 1988.

Stocker, John J., President, Shipbuilders Council of America, Washington, D.C., letter, July 15, 1988.

Verdon, William P., President, United Shipowners of America, letter, October 11, 1988.

Overseas Shipbuilding Group, Inc., Annual Report 1987, New York, pp. 9, 35.

Joint Committee on Taxation, U.S. Congress, General Explanation of the Tax Reform Act of 1986, U.S. Government Printing Office, Washington, D.C., pp. 6-11, 60-61, 98-99, 175, 432-433, 864, 926-927, 970.

APPENDIX E-3

BARRIERS TO LINER TRANSPORTATION SERVICES

It is frequently alleged that United States flag liner operators are disadvantaged by the discriminatory practices of foreign governments. As a corollary, the United States government is often accused of not acting with sufficient energy to counter the foreign discrimination. The Commission staff has prepared a brief listing, by geographic area, of the principal discriminatory trade barriers, some of which were eliminated or mitigated during 1988 by the vigorous actions of United States government trade negotiators.

A more comprehensive listing of barriers to United States trade is issued annually by the United States Trade Representative in conjunction with the Department of Agriculture and the Department of Commerce; _1987 National Trade Estimate Report on Foreign Trade Barriers_ is the latest edition and should be consulted for further details.

ASIA

AUSTRALIA:

Government Cargo Reservation: Forty percent of specified government cargo on certain routes must be carried in Australian flag ships.

Coastal Trade Restrictions: Foreign flag vessels must be licensed to operate in Australian coastal trade. In practice, the licenses are almost never granted.

BANGLADESH:

Cargo Waiver System: United States carriers are required to obtain waivers for the carriage of export cargo, a provision intended to increase the share of cargo that originates in Bangladesh to the Bangladesh national shipping line. The restrictions were tightened during 1986.

INDIA:

Cargo Reservation: United States flag carriers will face vastly reduced prospects in the United States-India trade if the Government of India carries out announced plans to submit cargo reservation legislation to Parliament and the legislation is enacted.

Shipping Tax: United States flag carriers are subject to a 5.5 percent gross receipt tax on exports from India and on imports to India. The tax does not take into account the profit or loss position of carriers serving India.

Bilateral Agreements: Fifty-fifty bilateral cargo sharing agreements exist with Iran, Poland, Romania, the U.S.S.R., Czechoslovakia, Hungary, East Germany, Pakistan, and Peru.

Port Charges: Indian national carriers receive reductions in port charges.

INDONESIA:

Cargo Reservation: Except where bilateral shipping agreements exist (see below), 45 percent of all cargo must be carried on Indonesian ships.

Bilateral Agreements: Fifty-fifty bilateral cargo sharing agreements are in effect with Egypt, Singapore, and the U.S.S.R.

JAPAN:

Discriminatory Treatment: United States companies may not act as their own operating agents or perform their own trucking in Japan, although Japanese carriers may do so in the United States.

High-Cube Containers: Until June 1988, United States flag carriers were restricted by Japanese laws and policies in the land movement of high-cube containers, even though the height of the containers on a low chassis is no greater than that of a standard container on a flat-bed truck. As a result of the agreement, United States flag carriers are now waiting for the restrictions to be eliminated fully, with the expectation that the problems they have continued to experience will be alleviated.

Tobacco Transport: For several years, United States flag carriers sought to break into the United States tobacco trade with Japan, which had been monopolized by Japanese carriers. After subjecting United States flag carriers to three years of trial shipments, Japan Tobacco and Salt Public Corporation, Japan's tobacco monopoly, in 1987 suddenly and without a test requirement selected a Taiwanese carrier, Yangming, to serve the majority of the tobacco trade, while granting only a small portion of the trade to United States flag carriers.

Port Service Problems: Until mid-1988, there was no cargo handling on Sunday in Japanese ports, resulting in increased costs to United States and other foreign carriers. Standard practice in major ports worldwide is to maintain cargo operations throughout the week. It remains to be seen in practice how well the June 1988 agreement by Japanese authorities to keep their port facilities open on Sundays will work.

Auto Carriers: United States flag operators have only recently broken into the Japan to United States auto trade to transport fully-assembled vehicles, and then only at token levels. Japanese car exports, however, are expected to decline as Japanese manufacturers open more assembly plants in the United States and South Korea. United States flag carriers are seeking a fair share of the movement of automobile components between Japan and the United States.

SOUTH KOREA:

Negative List: Ocean shipping is on the Ministry of Finance "Negative List" of enterprises in which foreign investment is prohibited, and the prohibition imposes a major impediment to United States flag carrier operations in South Korea.

Trucking Operations: United States flag carriers are prohibited from owning and operating their own trucking operations, or even equipment, in South Korea, even as part of their ocean freight services, although there are no such impediments on South Korean carriers in the United States.

Terminal Operating Restrictions: Until recently, United States flag carriers were prohibited from owning or operating their own terminal facilities in South Korea and were denied equal access to common user facilities. United States flag carriers sought the same preferential berth arrangements with the Pusan Container Terminal Operating Company as were accorded Korean flag carriers. As a result of United States government negotiations, on January 31, 1988 it was agreed that United States flag carriers would receive the same treatment as South Korean flag carriers for the use of container yards and container freight stations.

Shipping Agency Restrictions: The Korean Maritime and Port Administration requires that all sales, marketing, contracting, warehousing, maintenance, and repair be carried out by a 100 percent South Korean owned agent. Korean flag carriers, however, may act as their own agents in the United States.

Korean Foreign Shipowners Association: Foreign flag carriers, including United States operators, have been denied approval to form an association to represent their collective shipping interests in South Korea.

Commercial Discriminatory Practices: A major South Korean shippers' organization has refused to ship with United States flag carriers transshipping to a third country because of alleged documentation problems relating to United States quota regulations.

PAKISTAN:

Shipping Tax: Pakistan imposes an 8 percent gross receipts tax, one of the highest in the world, on foreign owned shipping. The tax, however, has been temporarily suspended for an indefinite period, retroactive to March 1986.

Cargo Reservation: Fifty percent of foreign aid cargoes shipped to Pakistan must be carried by Pakistani national flag ships (Note: The effect of the current 75 percent requirement for carriage of agricultural aid cargo on United States flag ships has not been assessed).

Bilateral Agreements: Fifty-fifty bilateral cargo sharing agreements exist with Egypt, India, and Poland.

PHILIPPINES:

Cargo Reservation: Government decrees are interpreted and employed in a discriminatory manner to direct non government supported and purchased goods to national flag shipping lines.

Discriminatory Treatment: National flag shipping lines pay no billing tax, but foreign lines pay 2.5 percent.

SINGAPORE:

Bilateral Agreements: A fifty-fifty bilateral cargo sharing agreement is in effect with Indonesia.

TAIWAN:

Trucking Operations: Until an agreement to end the prohibition, negotiated by the United States Maritime Administrator, was reached on March 2, 1988, Taiwan had prohibited United States flag carriers from owning and operating trucking services for the purpose of picking up and dropping off containers as part of their ocean transportation services.

Container Terminal Operations: Until the March 2, 1988, agreement was signed, United States flag carriers had been prohibited from operating their own terminals in Taiwan unless there was two-thirds Taiwanese ownership of the facilities.

Shipping Agency Service: Until the March 2, 1988, agreement was signed, United States flag carriers had been prohibited from providing agency services in Taiwan, except on their own behalf.

Domestic Cargo Participation: United States flag carriers are denied participation in Taiwan's domestic trade. Such access, as part of their international operations, would assist United States flag carriers in the repositioning of containers and in balancing container capacity utilization.

Import or Transfer of Dockside Equipment and Container Chassis Equipment: Foreign carriers are restricted from importing or transferring dockside equipment and container chassis into Taiwan, except for certain equipment that may be imported only upon payment of exorbitant import duties and taxes. Dockside equipment must be leased from harbor bureaus, and it is their prerogative to determine the brand, type, and rental rate of the equipment supplied. The restrictions were removed from United States flag carriers as a result of the March 2, 1988, agreement.

Taiwanese Liner Trades: Taiwan subjects its liner trade with the United States to substantial discriminatory allocation and reservation of cargo to Taiwanese flag vessels. Taiwan's cargo sharing and discriminatory practices restrict United States flag carriers in competitive access to cross-trades cargo.

Remittance of Earnings: United States flag carriers are unfairly restricted in remitting earnings from their Taiwan operations. There are no comparable controls on foreign exchange in the United States.

Cargo Reservation: Government preference laws cover 100 percent of government financed programs and the cargoes of government monopolies, including liquor and tobacco.

WESTERN HEMISPHERE

ARGENTINA:

Cargo Reservation: Government and private purchases and sales, and government financed imports, are reserved for national vessels, unless exemption is granted by the Director of the Merchant Marine.

Governmental Incentives: Governmental incentives favor the use of Argentine vessels by Argentine exporters. Regulations include reduced port charges, rebates of wharfage fees, elimination of consular fees, and export charges on cargo shipped on foreign ships. Export credit of up to 5 percent is granted on cargo transported on national flag vessels. Tax rebates for manufactured exports are calculated at F.O.B. (Free-On-Board) when shipped on foreign ships and C.I.F. (Cost-Insurance-Freight) when shipped in Argentine bottoms.

Bilateral Agreements: Fifty-fifty bilateral cargo sharing agreements are in effect with Brazil, Chile, Colombia, Lebanon, Peru, Venezuela, the U.S.S.R., and the United States. Two United

States lines have permission to cover southbound movement of Argentine government-controlled cargo.

BRAZIL:

Governmental Incentives: Brazilian vessels are exempt from "light dues" (taxes intended to support the operation and maintenance of navigational aids) and receive reduced pilotage fees at Santos and Rio de Janeiro. A stamp tax is levied on freight carried in foreign vessels.

Preferential Cargo Reservation: Imports purchased by public authorities or bought with government assistance must be carried in Brazilian vessels.

Limitations on Container Shipments: The government prohibits transshipment of containers in its trade and bans use of non ISO-sized containers, thus discriminating against foreign carriers.

Bilateral Agreements: Fifty-fifty bilateral cargo sharing agreements are in effect with Argentina and the United States.

CANADA:

Preferential Duties: Cargo moving directly from Great Britain and Singapore receives a preferential duty rate not granted cargoes moving via a third country, thus putting foreign carriers at a disadvantage in those trades because of vessel routing complications.

COLOMBIA:

Commercial Cargo Reservation: A minimum of 50 percent of cargo transported on established routes must be carried aboard Colombian flag ships.

Bilateral Agreements: Fifty-fifty bilateral cargo sharing agreements are in effect with Argentina and Uruguay, and there are equal access agreements with the Colombian national line and the two United States owned lines that serve Columbia.

Other Discriminatory Actions: Colombia has refused to admit a United States owned carrier into bilateral trade in order to carry cargo financed by the Export-Import Bank.

DOMINICAN REPUBLIC:

Commercial Cargo Reservation: Forty percent of all commercial cargo, 50 percent of "exonerated cargo," and 60 percent of government cargo is reserved for national flag lines.

MEXICO:

Commercial Cargo Reservation: The 100 percent Mexican Government-owned National Ocean and Inland Carriers, a multimodal operator set up in 1979, carries out all contracts with shippers and carriers to handle inland transportation of cargo, thus providing an opportunity for directing cargo to national carriers.

Limitations on Container Shipments: The "Container Decree" regulates the movement of all containers within Mexico, thus restricting the routing of cargo by the carrier and making it difficult for foreign carriers to compete effectively.

VENEZUELA:

Commercial Cargo Reservation: Venezuela's Merchant Marine Law stipulates that all preferential cargo (cargo destined for government use, financed by the government, subject to import licensing, or arriving under any import duty exoneration) must be carried in Venezuelan ships. In effect, Venezuela is attempting to reserve 50 percent of all cargo moving in its bilateral trade for its own carriers.

Bilateral Agreements: A fifty-fifty bilateral cargo sharing agreement is in effect with Argentina.

Other Discriminatory Actions: Venezuela recently successfully objected to the entry of an additional United States carrier into its bilateral trade with the United States.

EUROPE AND AFRICA

EGYPT:

Commercial Cargo Reservation: Thirty percent of all imports and exports must be carried in Egyptian ships.

Bilateral Agreements: Fifty-fifty bilateral cargo sharing agreements are in effect with Ceylon, Indonesia, Libya, Pakistan, Romania, the U.S.S.R., East Germany, Hungary, and Yugoslavia.

FRANCE:

Cargo Reservation: All national defense related goods, 40 percent of all coal tonnage, 66 percent of all petroleum tonnage, and all bananas must be carried aboard French ships. France also has a monopoly on traffic between metropolitan France, Tunisia, and Algeria.

Limitations on Cargo Containers: France has threatened to disallow the use of refrigerated cargo containers on the grounds that they do not meet the provisions of the international Agreement of Transport of Perishables (which, however, specifically exempt ocean shipping containers).

Export Insurance: Purchase of export insurance from the government-backed Export Insurance Company requires shippers to use a French flag vessel, if the insurance covers the cost of the freight.

WEST GERMANY:

Government Cargo Reservation: Government-impelled foreign aid cargoes must be carried on West German ships.

GHANA:

Commercial Cargo Reservation: A minimum of at least 25 percent of all timber exports must be carried in Ghanian ships.

ITALY:

Discriminatory Treatment: Shipping agents for all foreign flag merchant ships must place monies in escrow to cover all obligations of each ship and must certify that they have done so before each ship may depart. The requirement results in tying up funds for about 90 days.

TURKEY:

Commercial Cargo Reservation: All imports must be carried on Turkish vessels, unless specific permission is given to do otherwise.

Preferential Taxation: Domestic carriers are exempt from revenue taxes levied on United States and other foreign carriers.

YUGOSLAVIA:

Commercial Cargo Reservation: C.I.F. (Cost-Insurance-Freight) cargoes are reserved for national flag carriers, and a 20 percent rebate on the freight charge is given to users of national flag vessels.

Bilateral Agreements: Fifty-fifty bilateral cargo sharing agreements are in effect with Egypt and, probably, with other nations.

APPENDIX E-4

BETTER SHIPS ARE IMPORTANT TOO: INNOVATION IN THE UNITED STATES MARITIME INDUSTRIES

Contents

Introduction....187

I. Hull Forms....189
  Asymmetric Sterns....189
  Twin-Skeg Sterns....190
  Bulbous Bows....191
  Other Bulbous Forms....191
  Bigger Ships....191
  Arctic Operations....192

II. Appendages....194
  Wake Equalizing Ducts....194
  Mitsui Ducts and Hitachi Nozzles....194
  Inflow Control Upstream of Propeller (ICUP)....194
  Wake Adapting Fins....194
  Stern Wedges....195

III. Improved Propulsors....195
  Vane Propellers ("Grim Wheels")....195
  Large Diameter, Low R.P.M. Propellers....196
  Contra-Rotating Propellers....196
  Propeller Boss Cap Fins (PBCF)....197
  Wind Auxiliary Propulsion....197

IV. Roll Stabilization and Course Control....197
  Fin Stabilizers....198
  Passive and Active Tank Stabilization....198
  Rudder-Controlled Roll Stabilization....198
  Effect Rudders....198
  Schilling Rudders....199

V. Hull Drag Reduction Coatings....199

VI. Superstructure Forms....200

VII. Engineering Systems....201
  Gas Turbines....201
  Diesels....203
  Electric Drive....204
  Propulsion Derived Ship's Service (PTO)....205
  Auxiliary Engineering Systems....206

VIII. Operational Procedures, Management, and Manning....206

IX. Cargo Handling....208

X. Materials....210

XI. Shipyard Productivity Improvements........................212

XII. Conclusions...214

Bibliography..217

INTRODUCTION:

In commercial shipping, cargo ideally will be carried by the cheapest and most reliable means available. Programs that sustain the United States maritime industries through subsidy or cargo preference requirements will do neither the industries nor the nation any good if they are not accompanied by an effort to protect the capital investment in ships and shipyards through a constant upgrading of plant and facilities. More efficient, more quickly, and less expensively-built ships of higher reliability and productivity could do much toward reducing the comparative economic disadvantage of the United States merchant marine. More efficient ships and shipyards potentially would require smaller subsidization and less restrictive trade policies in order to ensure their sustainability as mobilization assets.

Once justly renowned for their technological innovations, the United States maritime industries in recent years have greatly reduced their attention to and investment in research and development. Most shipbuilders, lacking prospects other than Navy business, have retrenched on research and development ventures. Many operators, lacking markets for their services and being short of capital, have tended to shy away from innovative concepts. Drastic cuts in research and development funding by the Maritime Administration (MARAD) and industry, and a corresponding decline in surface ship hull, machinery, and electrical research by the Navy (much of whose work in that area has been applicable to merchant ships), has placed this country well behind the rest of the world in the design and construction of efficient ships.

Recent government investment in surface ship design-related research and development has been minimal. The Maritime Administration's research and development budget dropped from 1.8 percent of its total budget, $9.7 million out of $537.4 million in Fiscal Year 1985, to 0.7 percent in Fiscal Year 1987; for Fiscal Years 1988 and 1989, no monies were requested for research and development in the budget requests sent to Congress, and the administration successfully resisted a House of Representatives attempt to force the spending of $2 million for research in Fiscal Year 1989. The Navy, despite a resurgence of interest in surface ship-related Hull, Machinery, and Electrical (HM&E) research and development in 1986-1987, requested only $94.4 million under Fiscal Year 1988 and received from Congress only

$67 million, about 0.7% of the total Navy research and development budget and about a third of the amount devoted to similar research on submarine design.

A major contributor to the lack of innovation in the United States has been the precarious economic situation of the maritime industries. Another has been the innate conservatism of the merchant marine and the Navy, both of which, as institutions, have seemingly resisted new concepts as a matter of course. As an example, there is the notorious adherence to steam turbine propulsion by the merchant marine and the Navy long after the rest of the world had turned to more efficient means of powering ships. In the decades following the Civil War, our Navy amused its 19th century contemporaries by its refusal to part with sail propulsion, recently resisted mightily the introduction of the marine gas turbine, and today, with the amphibious warfare ships of the LHD 1 class, is building what eventually will almost certainly be the world's last remaining fossil-fueled, steam turbine-powered warships.

Research in the more advanced maritime nations has produced a broad selection of technologies to improve the energy efficiency of merchant ship hulls. Efficient diesel engines (and the promise of equally fuel-efficient gas turbine plants) and automated operation of machinery systems have produced significant savings in fuel, maintenance, and watch-standing manpower. Improved hull-form designs and the use of a variety of hull appendages and propeller innovations have resulted in merchant hulls that are upwards of 14 percent more fuel-efficient than similar ships without these features.

Individual shipboard energy-saving concepts are in most cases cumulative in their benefits. The Naval Sea Systems Command has estimated that, if the needed research and development programs could be funded, a destroyer could be built that would be over 35 percent more fuel efficient than are current ships. Although gains for merchant ships could not be that dramatic, many of the same ideas could be applied directly to commercial vessels, resulting in ships significantly less expensive to operate.

The means of building more efficient ships for less money and in less time have also been developed abroad. Although many of the construction concepts have been imported by American shipbuilders in response to the intensive competition for Navy construction programs, still other attractive ideas have yet to find favor in the United States. Innovative ship construction methods result in ships built more cheaply and quickly.

In January 1987, the Chief Engineer of the Navy issued a report, Ship Efficiency Improvement Technical Review, in response to direction from the Secretary of the Navy to find ways of building better ships. The authors were charged with determining the "payback" time for each innovation, with emphasis to be placed on those innovations that would pay for their development and installation through reduced fuel consumption and lower maintenance costs within three to five years.

Most of the concepts described met the payback criteria; they also improved the war-fighting qualities of the combatant ships by improving seakeeping and/or endurance, by increasing the volume and weight fraction available for weapon and sensor payloads, and, in many cases, by reducing ship noise signatures.

The report provided details of the numerous ways that surface ships could be improved as platforms for weapons and sensors and laid out a plan of action to improve the Navy's ability to take advantage of available and developing Hull, Machinery, and Electrical technologies. Most of the report's technology findings are directly applicable to merchant-type hulls.

In the following pages, technological innovations described in the Navy report and others equally applicable to the design and construction of merchant ships are described and evaluated.

I. HULL FORMS:

There seems to be a pervasive and wholly erroneous perception in the American maritime community that the displacement monohull has reached the acme of its perfection. The various ways of improving the efficiency of the monohull ship are among the advantages held by our foreign competitors, commercial and military. It is not necessary to reduce a merchant ship's carrying capacity to increase its speed. There are a number of energy saving or speed enhancing concepts that can be added to existing ships or, better, designed into newly constructed ships.

Stern Tunnels: Stern tunnels (or "tunnel sterns"), used in conjunction with full-sterned, single-screw hull forms such as those found on large tankers, are concave sectioned afterbodies in which the ship's centerline is higher than the depth of the hull at the sides. That form serves to improve the flow of water through the propeller to produce as much as a 10 percent reduction in power requirements. The incorporation of that stern form also facilitates the use of more efficient, large-diameter, low-speed propellers. The net result is a ship with less propeller cavitation and lower flow noise, which could have some survivability attractions in a wartime environment.

Stern tunnels are most conveniently incorporated in new ships, where their use adds modestly to the cost of construction; the payback period is relatively short. The few backfits that have been accomplished were performed primarily to cure existing flow deficiencies.

Asymmetric Sterns: For single-screwed ships, asymmetric sterns function to preswirl the water flowing into the propeller in a direction opposite to that of the turning of the propeller.

That results in less hull flow separation and decreased pressure resistance for full-formed, merchant-type hulls. An advantage of the asymmetric stern (which does add to the cost of construction) is that it can be combined with other efficiency-enhancement devices for a cumulative effect. Twin-screwed ships can achieve some of the benefits of the concept by employing opposite-turning propellers and swirl-forming skegs. By 1986, over 30 merchant ships had been constructed with asymmetric sterns and achieved from 5 to 9 percent improvements in hull efficiency. Comparative model trials during the development of the C-10 container ship design determined that, for a very large, fine-lined, single-screwed vessel, the asymmetric stern offered no gains in efficiency; its principal value is believed to be in improving the flow efficiency in shorter, fuller-bodied vessels.

More radical expansions on the asymmetric stern concept are the cochlea channel stern and the use of asymmetric gondolas for mounting the propeller. The cochlea channel stern is, essentially, an extreme variant of the asymmetric form to maximize the swirling effect and has not been applied to an actual ship. Only one merchant ship is known to have employed a gondola propulsion system. Despite predicted hull efficiency improvements of 25 percent and 15 percent, respectively, the cochlea channel and asymmetric gondola, because of the much higher construction costs their incorporation would entail, have not found favor.

Twin-Skeg Sterns: First employed during the 19th century and extensively explored by the United States David Taylor Model Basin in the late 1930s, the twin-skeg stern for twin-screwed merchant ships offers the advantages of smoothing flow into the propellers and providing the opportunity to employ optimum hull run within the "tunnel" between the skegs. The twin-skeg design also can take advantage of greater support and accessibility for the propeller shafts, forming the skegs to pre-swirl the water flow into the propellers, providing lower and farther aft mounting for the propelling machinery (thereby decreasing the proportion of the hull volume needed for machinery spaces), providing better hull support for dry docking, and giving better support to the propeller shafts to reduce vibration. Such a hull form also has the potential to permit the use of larger diameter, slower-turning propellers and the more secure mounting of vane-wheel ("Grim Wheel" -- see below) thrust augmentors. The most useful twin-skeg configuration would be shaped to "pre-swirl" the water entering the propeller.

United States Navy experience with twin-skeg designs has been confined to several World War II-era battleship classes that employed simple, symmetrical skeg configurations. Minor vibration problems with the ships were ascribed to the installation of the skegs, but the cause of the vibration was never directly linked to their presence.

Despite the lack of experimental proof, the Navy has neither employed twin skegs in any subsequent ships nor subsequently performed significant research on twin-skeg design. The limited commercial experience with twin-skeg applications has all been highly favorable, suggesting that further serious investigation of the concept should be performed.

Bulbous Bows: Despite wide-scale experience with bulbous bow forms since they were introduced early in this century, their use in United States merchant ships today is not as widespread as the potential benefits would seem to indicate. In recent years, the primary reason for the Navy's omission of bulbous bows from its new auxiliaries has been the additional initial cost although, for a 40,000 deadweight ton tanker, that amounts to less than $200,000. Bulbous bows are most easily incorporated into a ship while it is constructed, but they can and have been added to existing ships. The bulbous bow hull form reduces the wave-making resistance of slow and very full-bodied ships and can also be designed to improve the performance of combatant warships. Incorporation of a bow bulb can be expected to improve hull efficiency by at least 6 percent and, in full-bodied ships, by considerably more.

A recently patented invention by ship design innovator Sigurdur Ingvason solves the problem of optimizing bulb depth beneath the waterline for ships traveling at differing displacements. Ingvason has devised a variable-configuration surface-piercing bulb form whose upper surface can be raised and lowered.

Other Bulbous Forms: Bulbous forms can also be employed at the stern of a ship to improve water flow into the propeller and, when incorporated into the rudder, to reduce wake effects abaft the propeller. An "extreme" stern bulb, known as a Hogner stern after its developer, produces even greater efficiency. Less extreme stern bulbs can be incorporated into stern skegs and combined with other energy-saving appendages to improve efficiency. Their use entails additional expense in construction, but the payback period is normally well under five years.

Bigger Ships: Thanks to certain kindly laws of physics, larger ships need proportionately less power to achieve a given speed than small ones, hence the creation and growth of the supertanker. Until quite recently, most commercial ships had been artificially limited to a length and beam no greater than 965 foot by 106 foot by the restrictions of the Panama Canal -- the "Panamax Ship." The restriction also resulted in most pier-side cargo container-handling cranes having a reach no greater than is necessary to reach the furthest of the thirteen rows of containers capable of being carried on a Panamax-limited ship.

Until 1988, the largest Panamax container ships in service could accommodate no more than 4,482 Twenty-foot Equivalent Units

(TEU). The world's first larger-than-Panamax ship is American President Lines' German-built C-10 PRESIDENT TRUMAN, which was completed in mid-1988 as the first of a class of five 4,300 TEU ships for Pacific Ocean service. Significantly, American President Lines did not solicit construction bids from United States shipyards, and the ships incorporate a number of modern German-developed "Ship of the Future" concepts.

By relaxing length and, more important for carrying capacity, beam restrictions, it is possible to construct practical container ships of 6,000 or even upwards of 10,000 TEU capacity and capable of being accommodated by existing harbors; of course, pierside cargo-handling equipment would have to be modified or replaced to reach the broader and higher stacks of containers aboard the larger ships, and it must still be proven that the concentration of so large a cargo payload is economically desirable.

The operating cost of the C-10 container ships is only five cents per mile per TEU, less than half the average operating cost of the owner's container fleet in 1984, thanks in part to the economies of scale in such large vessels. The 24-knot, post-Panamax ships have a beam of 129 feet, permitting the carriage of 16 rows of containers athwartships above deck, three more rows than could be accommodated in a Panamax ship; to serve the new ships, however, long-reach pierside container cranes have had to be acquired.

Even cruise ship operators are thinking about the economies of scale of larger ships: a 150,000 gross registered ton (GRT) mobile floating city project is under discussion for possible construction in Northern Ireland, and a 250,000 GRT, 1,247 foot by 253 foot cruise liner to carry 5,000 passengers and a crew of 1,800 is under consideration for construction in West Germany or Japan by Norway's Knut Kloster. Including naval vessels, there are already an estimated 1,800 ships worldwide that are too large to pass through the Panama Canal.

Arctic Operations: Both as a source of energy for the present and future and as an area with vast potential for minerals exploitation, the Arctic holds great promise. Although diplomatic considerations pose great complexities, the Antarctic is even more likely to provide enormous reserves of valuable minerals, food sources, and energy resources during the next century. Exploiting those resources will require specialized vessels of greater efficiency than are currently generally available. Specifically, the ability to operate in ice-filled or ice-covered waters under extremely low temperature conditions will be of paramount significance.

To date, icebreaking hull forms have been almost entirely variations on the 19th century designs of the Russian Admiral Makarov, with steeply sloping and robustly reinforced bows and round hull sections. Those shapes have proven acceptable for ice operations but hold considerable penalties in seaworthiness during open water operations. For commercial cargo vessels intended to operate in ice, the traditional form and the additional power needed to break through ice have proven serious handicaps to profitable operations, so much so, in fact, that it was cheaper to construct a pipeline to deliver Alaska North Slope oil to ice free ports than it would have been to build or convert ice-capable crude carriers.

A successful solution to the ice navigation problem has been under intense development in West Germany for over a decade in the form of the Thyssen-Waas icebreaking hull, and the Soviet Union, which operates over 400 commercial vessels in arctic service, has been the first nation to take advantage of the concept's improvements over conventional forms. The Thyssen-Waas hull employs a broad, slightly concave bow form with splayed, sharply-rounded edges to displace ice through shear breaking rather than radial crushing. The hull form gradually evolves to a shallow vee-bottom that forces the ice to the side as it passes beneath the hull, and the broken ice ends up beneath the undisturbed ice alongside the resulting clear channel astern of the ship.

The Thyssen-Waas form has been demonstrated in the Soviet icebreaker MUDYUG to provide either an 80 percent increase in the thickness of ice that can be broken for a given horsepower or, conversely, a reduction by half in the power needed to break a given thickness of ice. Its use also gives a virtually ice-free path astern of the hull, which offers great advantages for following ships in convoy, while the ice alongside remains unbroken, which offers advantages in loading and unloading cargoes. Open water performance offers no powering penalties, while roll, pitch, and heave characteristics are greatly superior to standard forms. There is virtually no ice pressure on the sides of the hull, allowing for greatly simplified hull structures and longer operational service. For commercial purposes, the use of the Thyssen-Waas hull form offers the advantage of extending the ice navigation season by up to eighty percent.

The United States Coast Guard has shown some interest in the Thyssen-Waas hull form, sponsoring model tank trials of a modification to its standard small icebreaking tug hull, but there are unfortunately no plans to employ the concept on an actual ship or on the proposed new Coast Guard polar icebreakers. Sweden is building two 24,500 horsepower icebreakers to a modified version of the Thyssen-Waas hull design. It would appear, however, that the principal beneficiary will be the Soviet Union, which already enjoys a lead in high arctic vessel technology that should ultimately enable it to exploit more fully than any other nation the commercial resources of the area.

II. APPENDAGES:

The use of fins or ducts to improve water flow into or abaft propellers has seen widespread acceptance abroad in recent years, but the major employment on a United States built design has been to correct a flow problem on an existing naval oiler class. There are several major concepts:

Wake Equalizing Ducts: A recent West German development already used on over 150 merchant ships is the ZAD (Züstrom-Ausgleich Duse), or wake equalizing duct, an inexpensive (about $50,000 and four days in dock to install) U-shaped appendage mounted on the skeg forward and above the propeller on a single-screwed ship. By 1986, more than 150 such ducts had been added to existing ships or incorporated during construction. For a typical product tanker hull form, the resulting efficiency improvement is about 6 percent whether the ship is in loaded or ballast condition, and the addition of a Wake Equalizing Duct typically pays for itself within a year. ZADs can be combined with asymmetric or bulbous sterns to convey even greater efficiency.

Mitsui Ducts and Hitachi Nozzles: By 1986, approximately 70 tankers and bulk cargo ships had been equipped with the Mitsui Duct and another 30 with the similar Hitachi Nozzle. Both are ring-shaped flow-modifying appendages located forward of the propeller disc where, unlike the similar Kort nozzle, which surrounds the propeller, they do not cause cavitation erosion. For a typical product tanker, installation of either the Hitachi or Mitsui devices adds about 10 percent to the efficiency of the ship when fully loaded and 12 percent when the ship is traveling in ballast. Requiring about two weeks in dock to install, the ducts cost between $380,000 and $575,000 (in 1986 dollars) and are expected to pay for themselves in five to nine years.

Inflow Control Upstream of Propeller (ICUP): On ships or craft with free-standing propeller shafts (generally combatant ships but also such commercial types as oilfield crew boats and small personnel ferries), mounting flow-directing fins on the propeller supports directly forward of the propeller can be used to reduce cavitation and improve efficiency. The Coast Guard has had considerable success in developing such fins for patrol boats, boosting speeds by 1.5 knots without additional power.

Wake Adapting Fins: Fins, usually in multiple sets, can be mounted on full-bodied hulls forward of the propeller disc and on the hull or rudder stocks abaft the propeller disc to improve water flow and to reduce propeller-induced vibration problems. Such fins have been employed on United States ships almost exclusively to correct existing vibration, cavitation, or noise problems, but the fins can also modestly improve overall hull efficiency and can be installed in conjunction with other efficiency features to increase the overall effect. Although improvements of as much as 12 percent have been noted in some of the European ships where fins have been added, 3 or 4 percent improvement is a more typical result.

Stern Wedges: Developed in the mid-1920s and subsequently used extensively in German and Italian destroyer, frigate, and small combatant designs, the stern wedge is useful for fast ships having large dynamic trim, producing a change of the pressure distribution over the bottom of the hull at the stern and resulting in a decrease in the aftward trim of the ship at the upper end of its speed range. Stern wedges can reduce propulsion power requirements by 5 to 10 percent at the upper end of the speed range (or can add a similar improvement to top speed for a given power level), but the wedge causes additional drag at lower speeds. The Royal Navy has installed on a frigate a variable-geometry wedge similar in principle to the hydraulically-controlled flaps at the sterns of some high-speed planing-hulled craft.

Lack of basic research has prevented full exploitation of the possible benefits of using wedges in slower, fuller-bodied ship designs. Stern wedges can either be designed into a new construction hull or added to existing hulls; even in the latter case, the cost and time are minimal, and the estimated payback period is well under a year.

III. IMPROVED PROPULSORS:

In addition to improving the shape of hulls and adding various appendages to improve the flow of water into a ship's propellers, it is also possible to install better propellers. Some of the propulsor aids would require installation on a new ship for the most effective utilization, while others are suitable for addition to existing vessels.

Vane Propellers ("Grim Wheels"): The Grim Wheel, named for its West German inventor, is a free-wheeling rotor mounted coaxially abaft a ship's propeller to recover wasted rotational energy and convert it into useful thrust. Over 50 European merchant ships had been equipped with Grim Wheels by 1986, and more installations were planned. Energy savings of 9 percent in a typical product tanker can be achieved with a vane propeller, and improvements of up to 14 percent have been noted in finer-lined dry cargo vessels. For a 40,000 deadweight ton (DWT) tanker, backfitting would require two days in dock and cost about $235,000 (1986 dollars), paying for itself within four years. A recent, misguided attempt to employ Grim Wheels on the re-engined passenger ship QUEEN ELIZABETH II was a failure, apparently because too much power was expected to be absorbed by the vane propellers and the blades broke off. In a properly-designed installation on a suitable ship, however, Grim Wheels can be of significant benefit in reducing operating costs, especially when combined with inflow vanes, asymmetric stern forms, and other inflow modification concepts.

Large Diameter, Low R.P.M. Propellers: Most large, low-speed diesel-powered merchant ships have large diameter propellers that rotate at a little over 100 revolutions per minute (r.p.m.). Lowering the rotation speed and enlarging the propeller diameter still further would increase efficiency since, in general, the most efficient propulsor is one that accelerates the flow least. Lower r.p.m. also reduces cavitation and vibration. Lowering r.p.m., however, would mean introducing reduction gearing into low-speed diesel propulsion systems, thereby adding to acquisition and maintenance costs; hull forms would also have to be altered to accept the larger propellers and use them most efficiently. Thus, although 15 to 20 percent gains in propulsive efficiency are theoretically possible, the payback period can exceed half the expected economic life of the ship, and only a handful of commercial ships have been built to take advantage of very low r.p.m. propulsion.

Contra-Rotating Propellers: Contra-rotating propellers can achieve greater efficiency than a standard propeller of the same power output, through lower loading per blade and cancellation of swirl loss. The diameter of a contra-rotating propeller is also less than that of its conventional counterpart, making it possible to reduce interaction between the propeller wash and the hull. Because of the higher acquisition cost and greater mechanical complexity, however, contra-rotating propellers had, until recently, found application for marine purposes only on torpedoes (for torque equalization) and special-purpose craft, with the Navy also having installed a set on the nuclear-powered submarine JACK.

Ishikawajima-Harima Heavy Industries (IHI) and Mitsubishi Heavy Industries (MHI) both offer competing commercial ship contra-rotating propeller systems with a ten percent claimed increase in propulsive efficiency. MHI began installation of a prototype system on the car carrier TOYOFUJI 5 during 1988 for a one-year trial sponsored by the Japan Foundation for Shipbuilding Advancement.

In an investigation performed by the Maritime Administration on the possible employment of a contra-rotating propeller on a commercial Ro-Ro ship, a power saving of 14 percent was achieved at the design speed of 23 knots. An estimated 7 to 15 percent reduction in power requirements for a given speed can be gained through the use of contra-rotating propellers, depending on the type of ship for which they are intended, but the greater acquisition cost would result in payback periods of as much as ten years.

Contra-rotating propellers, for most applications, imply contra-rotating geared power transmission. In the early 1970s, when it appeared that high speed container ships would continue to be commercially viable but conventional geared transmissions were causing vibration and wear problems at top speeds in the SL-7 class, the Maritime Administration sponsored design and prototype construction of two 8 foot diameter, planetary-geared, 60,000 shaft horsepower lightweight gearboxes, one for a conventional propeller and one contra-rotating. Both were highly successful and would have been mass-producible at relatively unsophisticated facilities, but no market for such systems developed and the prototypes remain in storage.

Propeller Boss Cap Fins (PBCF): Introduced by Mitsui O.S.K. Lines in October 1987 and developed in cooperation with the West Japan Fluid Engineering Laboratory and the Mikado Propeller Co., the "PBCF" employs one fin for each blade of a ship's propellers, attached to the propeller cap abaft the blades to reduce propeller hub-induced vortexes. Since January 1988, over 23 merchant ships have been equipped with PBCFs, providing demonstrated efficiency improvements on an effective horsepower basis by from 3.2 to 6.7 percent, with the greatest savings coming on higher speed ships with pronounced hub vortexes. Comparative trials with two otherwise identical 44,979 GRT car carriers in September 1987 showed a 4 percent propulsive efficiency gain for the ships with a PBCF. The PBCF can easily be backfitted on existing ships, with an installation on a 10,000 horsepower ship said to cost about $49,000 and requiring only four or five hours in drydock; it would pay for itself in under a year.

Wind Auxiliary Propulsion: Since 1980, some 15 sail-assisted commercial ships, ranging in size from a 319-ton tuna long-liner to a 26,000 DWT bulk carrier, have been completed in Japan, employing research and development assistance from the Japanese Shipbuilding Industry Foundation and the Japan Marine Machinery Development Association. Sail-assisted ships employ computer-controlled, mechanically-deployed sails as an integrated auxiliary propulsion system to augment diesel main propulsion engines. Efficient sail design and automated deployment and orientation of the sails have resulted in energy savings of 40 percent on a 15-day trans-Pacific run by the 26,000 DWT bulker, during which voyage the sails could be employed 79 percent of the time. The sails also had the effect of reducing rolling by 20 to 30 percent, and their operation and maintenance required no additions to the normal crew. Sizable cruise liners, of course, are now being built with sail main propulsion, but for that application the benefits are in large measure aesthetic.

IV. ROLL STABILIZATION AND COURSE CONTROL:

Although roll stabilization systems have been in widespread use since the second decade of this century, their principal application has remained in warship and passenger ship design, where the efficiency and comfort of the personnel have justified the added cost of their installation. Roll stabilization also results in more accurate course-keeping, leading to significant savings in fuel consumption in heavy weather.

Fin Stabilizers: Gyroscopically controlled fin stabilizers have been in widespread use since before World War II in warships and, more recently, in passenger vessels. Fin stabilizers do add a modest degree of appendage drag (although retractable fins have been widely and successfully employed), but so do the fixed anti-rolling bilge keels attached to many hulls to dampen roll. In the United States Navy, early poor experience with the reliability of fin stabilization systems and a certain degree of machismo prejudice against systems that increase crew comfort are gradually being overcome as the systems grow more reliable and the improvements in combat effectiveness that they cause have come to be realized. The earlier lack of United States Navy interest, nonetheless, helped to retard development of stabilization systems for merchant vessel use in this country.

Passive and Active Tank Stabilization: Roll stabilization need not be performed by fin appendages. Also available are passive and active systems that move liquids from side to side to dampen roll, with the tanks located either within the hull or in the superstructure; tank stabilization, of course, consumes volume, just as do the mechanisms for actuating fin stabilizers. Fin stabilizers provide greater precision of control, while tank systems require less maintenance and power and are generally preferred for ships that operate at lower speeds.

Rudder-Controlled Roll Stabilization: A recently introduced method of roll stabilization employs a ship's existing rudder or rudders, controlled by a computer, to add or reduce rudder angle to the extent needed to reduce roll as well to keep to a given course. Both the United States Navy and United States Coast Guard have had considerable success with rudder roll reduction systems, and the Coast Guard has modified three of its largest high-endurance cutters to use the system. Tests with Danish and Swedish Navy ships have resulted in roll reductions of up to 60 percent. A United States Navy-developed rudder roll control system went to sea in the destroyer CUSHING during 1988 and was expected to reduce rolling by up to 40 percent. Rudder roll stabilization systems that can be combined with a ship's autopilot are commercially available from licensee manufacturers in the United States.

Effect Rudders: On ships with two rudders, a slight toeing-out can produce an effect at higher speeds similar to that of the stern wedge for transom-sterned vessels, through creation of a specific pressure distribution at the stern with a resulting decrease in the ship's wetted surface and of its stern wave. Through the use of a computer-controlled rudder angle program, the opposite angles of the rudders can be reduced or eliminated at lower speeds to reduce resistance. Benefits for higher-speed ships include a potential 10 to 12 percent reduction in power required at high speeds, or a speed increase for a given power level of 3 to 4 percent. The use of the "Effect Rudder" could be combined with computer-controlled rudder roll-damping (see above). The "Effect Rudder" was developed in Germany and used on high-speed small combatants during World War II; its potential benefits for merchant vessel applications have not been explored systematically.

Schilling Rudders: A number of improvements to the simple rudder have been developed and introduced on foreign ships since the Second World War. Flapped rudders add a second, hinged surface to the aft end of a rudder to increase its efficiency. Flettner-type rotor cylinders have been added to the leading edge of rudders to allow larger rudder angles before flow separation occurs, and they have been combined with the flapped rudder in some installations. Small electrically-driven propulsors have even been added to rudders for low-speed maneuvering. The most efficient and mechanically simple rudder efficiency enhancing concept to have been employed to date, however, is the Schilling rudder, which has been installed on some 150 ships of up to 68,000 DWT since 1975.

The Schilling rudder uses an improved hydrodynamic shape and top and bottom endplates efficiently to employ propeller slipstream and, because flow breakaway does not occur until the rudder has been put hard over to over 70 degrees, the rudder can also be employed as a stern side-thruster. When mounted in pairs behind a single screw, Schilling rudders, rotated differentially, can be used as effective thrust reversers. Joystick control, in conjunction with a Schilling rudder installation, can provide a high degree of maneuverability. The system can be backfitted easily in most existing single-screwed ships and has been certified for use in vessels of up to 100,000 DWT.

Further research in the design and control of rudders might result in a system that would combine the benefits of the Schilling rudder, the Effect Rudder, and rudder roll control in one computer program.

V. HULL DRAG REDUCTION COATINGS:

Hull drag reduction coatings are one area where the United States is fully competitive. The difficulty in using most of the tributyltin (TBT, or "organotin") coating compounds that have been developed in recent years to combat the growth of marine animals on hull underbodies has been the degree of environmental damage they may or may not cause. The widespread use of such coatings on pleasure boats, where they may not be properly mixed or applied, has caused alarm about the effects on marine life in general, and the majority of the major free world maritime nations have banned the use of TBT anti-fouling coatings on craft of less than 25 meters in length. In the United States, the use of such coatings by the Navy and by commercial operators has been restricted pending the outcome of Environmental Protection Agency research and standards setting. The irony of the situation has been that the Navy-developed TBT coatings, which are just as effective as the commercially available coatings, have a far lower rate of ablation.

The use of drag reduction coatings has great potential for reducing the operating costs for ships. Worldwide use to date is estimated by one manufacturer to save upwards of $200 million per year on the total world merchant marine fuel bill. Without long-lasting coatings, ships must either be docked to have their hulls scraped, or special submersible scrubbing systems must be employed. Navy test coatings have produced hulls free of marine growth for as long as seven years.

Marine growth on ship hulls is not a trivial matter: the Navy estimates that, with no hull cleaning or anti-fouling program, a typical frigate hull would consume almost twice as much fuel per day after five years. Universal employment of effective anti-fouling coatings by Navy ships would save an estimated 12 percent on the annual surface ship fuel bill (or about two million barrels of fuel per year, Navy-wide), and major savings in fuel costs and maintenance would also obviously be realized by commercial operators as well. Fortunately, the coatings industry has not stood still, and a number of effective TBT-free coatings are now becoming available. Still needed, however, is a means other than mechanical for limiting or eliminating fouling on ship propellers.

Modern coatings technology is now also supplying long-lasting and wear-resistant paints for topside preservation of ships, greatly reducing the effects of corrosion and the costs of maintenance. Surface treatment processes promise greater resistance to corrosion for aluminum alloys. One new process, involving the addition of a polymer layer that also provides a 50 percent penetration of the oxidated metal surface, was originally developed in the United States but is now marketed in Great Britain; it offers a surface treatment for aluminum that renders the material harder than nitrided steel and resistant to acids, salt spray, and alkaline humidification, as well as providing such lubricity that ice has difficulty adhering.

VI. SUPERSTRUCTURE FORMS:

Perhaps because of the ascendancy of the rectilinear cargo container and the increasing costs of shipbuilding in general, the use of streamlining in merchant ship structures above the waterline has been confined largely to cruise liners in recent years. Thus, in most modern container ship designs, row after row of high-stacked containers are trailed by a similarly high and boxy stern superstructure, and even tankers have largely forgone aesthetics in favor of simplified structures. Wind resistance, nonetheless, provides significant added power requirements for ships, particularly as they have grown ever larger.

An inexpensive solution to the problem of partially streamlining container ships has been developed in Japan by Mitsui Engineering and Shipbuilding Co., Ltd., through the use of collapsible canvas-covered air resistance reduction tents -- much like the solid structures that appeared atop the cabs of eighteen-wheelers on American superhighways when the cost of diesel fuel began to rise. The tents are erected at the bow, leading to a smooth air flow up and over the container stack. On a prototype installation aboard a 16,900 DWT vehicle carrier, an "ART" (Air Resistance Reduction Tent) produced a 2.5 percent saving in energy even in 15 meter per second winds; the device also reduced deck wetness and added only negligible weight to the ship. Mitsui also recommends installing ARTs forward of the bridge as well as at the bows of commercial ships.

In general, many types of commercial vessels can benefit from a more careful design of superstructures to reduce wind resistance, and the trade-off in higher construction costs can be balanced through lower fuel consumption over the life of the ship. Proper shaping of superstructures, masts, and stacks can also reduce radar signatures and disburse exhaust heat, improving the survivability of ships in wartime; although the concept has received wide attention in warship design, it may also have benefits in the design of merchant ships intended for mobilization duties.

VII. ENGINEERING SYSTEMS:

Gas Turbines: Gas turbine propulsion, touted in the post World War II-era as the coming form of prime mover for both military and commercial ships, is now found almost exclusively on the former. After a brief period of adaptation of industrial-type heavy gas turbines for marine propulsion, the maritime world settled on engines derived from aviation engines. Nearly all of the marine gas turbine power installations now in use are based on engines originally developed during the 1950s. Therein lies the reason for their non-acceptance for commercial maritime purposes, for those engines, regardless of the other advantages that they may offer in terms of lower maintenance, ease of maintenance, and lower acquisition cost, still consume more fuel per horsepower per unit of time than do diesels or steam turbine installations. Indeed, the few gas turbine installations employed in commercial cargo vessels prior to the fuel crisis of the early 1970s have now mostly been replaced with diesels, with the loss of power accepted.

Nonetheless, gas turbine installations still offer great potential for application in large commercial vessels. Even without long-promised and technologically feasible improvements in fuel efficiency in the basic power units, the turbines alone offer such significant savings in installation, maintenance, and manpower costs as to be attractive for applications like cruise liners, where the savings can be devoted to increased passenger capacity and comfort. Combined with such energy efficiency enhancing concepts as RACER (RAnkine steam Cycle Energy Recovery), or simpler and even more efficient intercooling/regeneration, gas turbines offer the potential for fuel efficiencies equal to those of the latest diesel installations.

The RACER concept employs otherwise wasted heat from the gas turbine exhaust to operate a boiler, producing steam that is then run through a turbine geared to the propulsion shafting. With such a system, either the total power output of a given prime mover system can be increased or the gas turbine selected for a given power requirement can itself be less powerful; in either situation, the gas turbines can be run at their most economical power setting. The Navy's RACER prototype, however, failed to demonstrate either the reliability or improved efficiencies promised, and development has been halted.

The intercooled regenerated (ICR) gas turbine system would dispense with the added complexities of maintaining a steam system aboard ship and of transmitting the additional power to the propulsion shafting. Instead, seawater cooling of the intake air between the low pressure and high pressure stages of the turbine in order to make the air more dense would be combined with an exhaust heat-exchanger used to recycle hot air to the high pressure air exit end of the turbine. The result would be a significant increase in the overall fuel efficiency or power output of the basic gas turbine. In an ideal system, the two heat exchangers would be combined with a variable area power turbine in order to maintain high efficiency over a wide range of output power. Because ICR installations would require about 25 percent less airflow than a conventional marine gas turbine for the same power output, intake ducting and exhaust space volume can be significantly reduced, rendering more volume available for revenue cargo in commercial applications and reducing the size of superstructures in combatants. Exhaust temperatures also would be lowered, reducing the ship's heat signature and simplifying the design and location of easily damaged antenna components.

ICR gas turbines would also make excellent ship's service electrical power generator/alternator prime movers, offering 20 to 30 percent improvements in fuel economy over present systems and making the gas turbine fully competitive with the diesel for such installations; the AVCO AGT 1500, the engine used to power the Army's M1 tank, already uses regeneration and a variable-area turbine, and the Navy is giving consideration to adapting the same engine, which generates 1,500 brake horsepower, for use as the prime mover in a generator set.

The use of ICR is predicted to offer a fuel use reduction of up to 37 percent in a naval frigate application. The specific fuel consumption rate is expected to be about 20 percent less than that of the current LM-2500 engine. Although that is still higher than marine diesel engines, lower acquisition, manning, and maintenance costs may make up the difference.

The principal holdup in the adoption of ICR turbines for naval ships is the leisurely pace of development by the United States Navy, which is hampered by low levels of funding for surface ship-related "HM&E" research and development. If a decision were made to incorporate such a system, it could be ready in time for installation in the third flight of DDG-51 class destroyers, around 1995; otherwise, the current effort will produce no concrete results prior to the end of the century.

Simple gas turbine propulsion would be the preferred propulsion system for any mobilization ship design, due to the nature of the strategic sealift support missions of such austere ships, the ready availability of production facilities for the gas turbines, and the simplicity and ease of maintenance of the plants. Gas turbine propulsion, employing ICR and other control, basic design, and reliability enhancements now known to be feasible, is expected eventually to become the preferred propulsion medium for many commercial ship types.

Diesels: The diesel engine, despite occasional claims that its development has gone about as far as it can go, continues to evolve through improved reliability, ease of maintenance, and fuel efficiency. To take advantage of the greater propulsive efficiency of low-revolutions per minute (r.p.m.) propellers, low-speed, direct-drive engines that rotate at under 100 r.p.m. are now being offered. Marine diesels of 57,000 brake horsepower are being used in merchant ships, approaching the current practical limit of 70,000 horsepower per propeller shaft imposed by shaft diameters and structural strength requirements; United States Navy research in the use of composites for propeller shafting may eventually permit greater horsepower to be transmitted to a single propeller. Rotary diesel engines ("Wankel" engines), which have long promised potential gains in fuel economy, are now being offered in sizes large enough to be practical for use in propelling small commercial craft.

As an example of the savings that are still being realized in the evolution of the diesel engine, the use of partially stabilized magnesium zirconate ceramic coatings on diesel engine cylinder heads has demonstrated not only a 13 percent saving in fuel consumption but also improved engine wear, virtual elimination of carbon deposit buildup, and significantly reduced levels of exhaust smoke and pollutants.

An important area for further development of marine diesel applications (and gas turbines, too, for that matter) is in improving their tolerance for the lower quality petrochemical fuels that will eventually be the best that can be afforded for marine transportation. Coal slurries for use in diesel, gas turbine, and steam plants continue to hold promise, but there has been little practical development and the environmental penalties are likely to remain high.

The major area of marine diesel engine research in the United States continues to be through improved turbocharging and fuel-injection systems. Unfortunately, much of the government-sponsored "research" consists of confirming the utility of equipments already commercially available abroad.

Electric Drive: In recent years, the use of electric drive has been confined mainly to icebreakers and submarines, although the re-engined liner QUEEN ELIZABETH II employs a diesel-electric plant. In the early decades of the century, the United States Navy employed turbo-electric drive in battleships and aircraft carriers as a means of avoiding the use of complex gearboxes. During the Second World War, destroyer escorts used turbo-electric drive to get around the shortage of gear manufacturing capacity, and numerous tugs and salvage ship classes used diesel electric drive because of the flexibility it conferred in transmitting power from the prime movers to the ships' single propeller shafts.

Electric drive has been offered as a means to avoid the use of complex gear and clutch arrangements and of controllable-pitch propellers in gas turbine propulsion installations. Particularly attractive has been the concept of using multiple prime movers to drive electric alternators that supply all power needs for a ship, both for propulsion and for auxiliary (hotel) services. Electric drive systems also permit greater flexibility in allocating power under damage conditions or when there are reduced power requirements, and separating the prime movers from the electric propulsion motors permits shorter propeller shafting, which reduces vibration, permits more convenient ship layout, and reduces maintenance.

The United States Navy has been experimenting, at a fairly low level of effort, with superconductive electric propulsion since 1969. In 1980, a 300 kilowatt gas turbine-driven superconductive homopolar generator was used to drive a 400 horsepower superconductive homopolar motor in a test craft, and a 3,000 horsepower system replaced the original installation in 1983. The Navy hopes to exploit the advantages of light weight, operating flexibility, and flexibility of installation in such "exotic" advanced hull forms as the SWATH (Small Waterplane Area Twin Hull) ship, where electric drive would permit optimizing the hull form and mounting the prime movers above the waterline to reduce radiated noise.

Electric drive would also permit the use of podded propulsion on monohulled ships, allowing more efficient hull shapes to be employed. The Navy has estimated that, if electric drive were substituted for mechanical drive on a SPRUANCE class destroyer, the resultant fuel saving would be 16 percent, while overall ship acquisition cost would decline by 6 percent. The Navy's David Taylor Naval Ship Research and Development Center at Annapolis is planning to install a twin pod, tractor propeller propulsion system in one of the two ASHEVILLE class former gunboats that it uses for experimental development; the "podded tractor-drive propulsor" is expected significantly to raise the ship's cavitation inception speed.

The principal deterrent to wider use of electric drive has been the size and weight of the electric power generation systems and the propulsion motors, and the waste heat that they produce. Although considerable research has been done on developing supercooled "homopolar" electric engines, no operationally employable hardware has yet resulted. The forceful advocacy of electric propulsion for surface combatants by the Chief of Naval Operations in September 1988 appears to mark a change in the fortunes of electric drive in the United States Navy. The stimulus of the $100 million added to the DARPA budget for submarine research, plus possible spin-offs from ongoing Navy submarine research, may also benefit surface ship applications.

The developing science of superconductive electricity holds enormous promise for still further reduction in the size of electrical components, although, in the absence of any government-sponsored research and development for merchant marine applications, the use of such equipment on commercial ships will be many years off and may depend on Navy research successes. Japan's Foundation for Shipbuilding Advancement, in cooperation with Toshiba, Mitsubishi, and Kobe Steel, is embarking on a $40 million effort to develop a 22-meter, 150-ton prototype vessel expected to develop 8 knots from a twin internal field superconductive electromagnetic hydraulic propulsion system; the ultimate aim, which its developers say may take fifty years to achieve, is the production of a practical commercial cargo ship powered by a form of linear induction motor. Yokohama University and Sumitomo Heavy Industries are cooperating in the design of a 650 foot commercial cargo vessel that will use superconducting engines to drive conventional propellers, and they have already built and tested a 650 horsepower trial craft.

Propulsion Derived Ship's Service: For use when a ship is underway on its cruising engines, electrical current generation by means of power take-offs (PTO) from the ship's prime movers offers significant fuel savings; the Navy's new Military Sealift Command T-AO 187 class oilers employ PTO ship's service power generation and have achieved 11 percent fuel savings over a conventional system with separate electrical power generation -- in effect, providing a potential 17 percent increase in unrefueled range. PTO power does require more sophisticated electrical control systems, but the use of PTO power is expected to pay for itself in five to seven years through lower fuel usage and reduced maintenance.

An even more ambitious use of propulsion derived ship's service power has been achieved in the new Danish container ship MARCHEN MAERSK, where the 53,000 horsepower diesel main propulsion engine drives a shaft generator, and the main engine's exhaust and that of the three diesel generator sets are used to drive a gas turbine generator; when excess electrical power is developed by the system, the power can be fed back to the shaft generator to add propulsive energy to the ship.

Auxiliary Engineering Systems: Although underfunded, Navy research is continuing into such auxiliary system improvements as energy-efficient, compact, lightweight, and reliable air conditioning plants; advanced high-pressure fans; and high-efficiency shipboard electrical components such as electric motors and fluorescent lighting. Virtually all of the research and development is directly applicable to commercial vessels, and much of the equipment has the potential to be backfitted during overhauls to existing ships. The Navy has also led the way in automating ship engineering system controls and maintenance procedures, again work that has direct commercial applications.

VIII. OPERATIONAL PROCEDURES, MANAGEMENT, AND MANNING:

Just as there is room for improvement in the design of all forms of ships and their mechanical systems, so is there opportunity for improving the procedures employed in operating and maintaining ships and, for merchant vessels, for improving the physical and managerial handling of their cargoes.

Much can be learned from the United States Navy, which pioneered planned maintenance concepts for ships. Also of potential utility for reducing maintenance costs, for reducing time lost during overhauls, and for reducing crew size, is the adaptation of Navy-developed machinery alignment techniques and the development of real-time monitoring and control systems for machinery. The Navy machinery alignment program has demonstrated 13 to 23 percent overall cost savings in repair time, parts replacement, and fuel usage in the steam-powered ships where it has been implemented.

For fuel use optimization, commercial computer programs, such as Wijsmuller Engineering's PERSUS (Performance Surveillance System) that show the effects on fuel consumption of various headings, speeds, ship's trims, and so forth, can be used to plot the most economical routings before a voyage is undertaken. Such systems have demonstrated 4 to 10 percent fuel savings, or even better under certain circumstances.

Fuel conservation is also a matter of psychological motivation for crews. Navy experience and recent management initiatives by at least two United States commercial tanker operators have shown significant fuel and other consumable reductions through proper motivation of ship crews. In the case of the tanker operator, vesting greater responsibility for a ship's overall operating budget in the hands of the crew (rather than with an increasingly bureaucratic central management structure) has brought significant benefits.

The Navy's fuel conservation plan had by 1985 achieved 8.1 percent fuel savings over 1975 levels, amounting to $66 million annually. The ambitious Navy goal is to achieve 20 percent savings by the year 2000. The Society of Naval Architects and Marine Engineers (SNAME) has published several energy use reduction research papers that are applicable to merchant vessels, but the most effective use of personnel aboard merchant ships still awaits reform of work rules and regulations before it can be implemented.

The benefits of automation in reducing crew sizes have been felt in the United States flag merchant marine, with the average size of ships' companies coming down from 40 or more personnel to around half that number in recent years. Understandable labor union resistance to further reductions, however, has prevented even greater gains like those being realized in foreign flag ships, where crews of fewer than ten are now being tried. American President Lines' new C-10 container ships operate with crews of 21 because of labor agreements and United States laws and regulations, but the ships were designed to be safely and efficiently operated by only twelve persons; thus a ship nearly as large as a United States Navy aircraft carrier can operate with less than half of 1 percent as many personnel! As commercial ships become ever more capacious and crews are further reduced, the productivity of the seagoing labor force continues its rapid and substantial growth.

A manpower reduction and automation project begun in mid-1986 under the sponsorship of the Danish government is typical of efforts being made by European countries anxious to retain the ranks of vessels in their national ship registries; the result of the development effort was to be the design of a 5,000 to 7,000 DWT container ship to be operated by a six person crew. The program has succeeded beyond expectations, in that a family of low-manpower vessels has emerged, ranging from a 7,500 DWT chemical tanker to a 7,600 DWT/500 TEU container ship, a 10,000 DWT/750 TEU container ship, and another container ship design; all are to be powered by single diesels and are to feature one-person watchkeeping; mooring and unmooring with only three persons; automated operation and maintenance recording for equipment; and automated cargo handling and accounting. To achieve its goals, the Danish project depends heavily on an integrated ship control system and electronic data processing. The addition of the integrated ship control system to the ship is said to cost about $900,000, while all of the features of the Danish program would add around $2 million.

An even more ambitious development effort is underway in West Germany to build on the already achieved successes of the "Ship of the Future" program. "SHOPSY 90" (SHip OPeration SYstem), sponsored by the Federal Ministry of Research and Development, five ship owners, and four shipyards, is intended to develop hardware and software to minimize on-board repairs and to reduce cargo handling costs. The SHOPSY concept will attempt to link the technical requirements of operating a ship with the logic and flow of the effort needed to carry out the work.

Reducing the manpower aboard merchant ships is obviously both a technological and political undertaking. Even the West German "Ships of the Future," designed to operate with crews of 12, carry 19-man crews in order to meet various existing manning regulations and to avoid labor union resistance. Obviously, however, reduced crew sizes on individual ships could also reduce the overall size of the nation's seagoing workforce and diminish the pool of skilled mariners available to meet all the manning requirements of a mobilization.

IX. CARGO HANDLING:

The United States has pioneered both the use of the standard cargo container and the ship-transportable cargo barge, the former having revolutionized the worldwide movement of dry, non-bulk cargo and the latter, ultimately, having proven an economic disappointment in practice. Roll-on/roll-off technology, after an initial flurry of interest in this country, is now limited to applications where short routes provide time advantages to offset the inefficiencies of transporting large volume, low value and low density vehicle-contained cargoes; other than specialized long distance new automobile and truck delivery ships, therefore, most "Ro-Ros" are European or Far Eastern owned, and even combination Ro-Ro/container ships have generally disappeared from United States registry.

More recently, United States shippers and transportation companies have enthusiastically embraced the concepts of "intermodalism," wherein the transportation of commercial cargo is conceived as a door-to-door rather than port-to-port service, and most frequently employs standard-sized containers. Through intermodalism, efficiency is enhanced by having a single carrier coordinating the movement and documentation among different modes of transportation, such as truck to railroad to ship to railroad to truck to destination. Intermodalism lends itself to the consolidation of the various modes of transportation under a single corporate management; significantly, among the currently most successful United States shipping companies are those that are part of integrated transportation companies that also operate railroad and trucking lines.

Intermodal transportation concepts lend themselves to such operations as "landbridge," wherein containerized cargoes moving from the Far East to Atlantic destinations can be transshipped across the United States mainland by rail for reloading aboard ship at considerable savings of time over the Panama Canal route. Indeed, the strategic and commercial importance of the Panama Canal has greatly diminished with the growing numbers of commercial and naval ships too large to use it, the increasing use of landbridge operations, and the construction of the petroleum pipeline across the Isthmus and other pipelines in North America.

The cargo container itself continues to evolve, both in versatility and size. The industry standard 20-foot container was succeeded by 40-foot boxes, which in turn are now being threatened by even larger containers, as the land transportation end of the intermodal equation develops to handle larger units of cargo. Containers have been developed to handle liquid products, and even rolled steel coils are now being shipped in special containers that, when emptied, can be collapsed for return shipment within other containers. Specialized bulk cargo (such as rare-earth ores) and heavy cargo items can be shipped in half-height containers, and extra-high containers are seeing more use as they become accepted on foreign highways. Currently being offered is an insulated container that is said to eliminate the need for refrigeration equipment to accommodate perishable cargo. The "container revolution," in short, is not yet over.

Barring some as yet unforeseen breakthrough in cargo packaging, the principal frontier for more efficient cargo movement improvements seems to be in the increased use of electronic documentation, or "electronic data interchange," not only by the shippers for bills of lading, but also in such innovative applications as the Customs Service's automated customs declaration system and the Federal Maritime Commission's automated tariff system. Already commercially available are on-line tariff data services and several proprietary cargo shipment tracking systems. The use of personal computers, modems, and telefacsimile equipment make it possible to conduct shipping transactions electronically, offering the potential for moving cargo directly from the pier to the customer and bypassing the warehouse.

The principal barriers to further expansion and efficiency in the area of automated documentation are the protection of proprietary information, and the gaining of acceptance for the utilization of automation by shippers and transportation companies; the necessary format standards have already been established by industry working groups.

Containerization of cargo has resulted in the transfer of shipboard cargo-handling capability to pierside, especially in long-haul liner ship applications, leaving the ships themselves totally devoted to the carriage of cargo. Although that is, of course, more efficient from a commercial standpoint, it tends to produce the "non self-sustaining" container ship of lesser military utility. For government financed container ship construction to be more easily justified under a "defense" rubric, therefore, the development of a removable shipboard container handling system would be of considerable value; it would also have some commercial application in making ships more versatile for the delivery of containerized cargoes to ports where pierside container handling cranage is less than adequate.

For the loading and unloading of bulk cargoes, a promising portable laminar flow pneumatic system has been designed and is slowly being developed under Maritime Administration sponsorship. Lack of research and development funding and general indifference from the small number of United States bulk cargo ship operators and from the grain shippers themselves has slowed the promising concept's possible commercial introduction.

One possible development in transoceanic transportation of dry cargo might be the further extension of the tug-barge concept that has proven so successful in coastal and short-sea operations. One of the principal economies in tug-barge operations has been their owners' success in obtaining permission to operate the combinations with far smaller crews that would be required to man standard commercial vessels running in the same trade. The principal drawback for long-distance tug-barge application has been the combination's slow speed.

There might be some improvement in barge transporter speeds through a marriage of the commercial heavy-lift float-on/float-off ships, used to transport outsized objects such as drilling rigs or entire manufacturing facilities, with very large, high container capacity barges; in effect, that would result in a LASH-type ship with but a single barge or very small number of large cargo barges to be left behind for unloading and reloading. A 10,000 TEU capacity barge carrier for Transatlantic service has recently been proposed; the cargo containers would be transported aboard six barges carried by a 23 to 24 knot semisubmersible mother ship, with the barges acting as feeder transporters at points of origin and destination.

"Flo-Flo" technology, after an initial intensive period of development and utilization, has languished in recent years, in large measure because of the world-wide decline in offshore oil exploration and exploitation. Of the fifteen self-propelled Flo-Flos built or converted to that function to date, the only one to be United States registered is on charter to the Military Sealift Command, her capabilities underutilized in her role as a storage ship for Army floating equipment at Diego Garcia. The float-on/float off heavy-lift cargo vessel continues, however, to be the most efficient means of safely and efficiently transporting outsized cargoes, such as oil drilling rigs, turn-key industrial facilities, and floating drydocks; the Flo-Flo's utility in salvage operations has been demonstrated in commercial applications, in the Falklands War, and in the recent retrieval of the mine-damaged frigate SAMUEL B. ROBERTS from the Persian Gulf.

X. MATERIALS:

The traditional metals used in the construction of large, oceangoing ships -- steel and, to a considerably lesser extent, aluminum -- are unlikely to be supplanted in the near future, but there are growing numbers of applications for the use of plastics and composites, ranging from entire hull structures to superstructure elements and engineering components.

Although the United States was an early leader in the use of glass-reinforced plastics ("Fiberglass") for hulls and superstructure blocks, the primary use of the material in recent years has been in pleasure craft. For larger hulls, the nation has had to import European technology, as in the recent and continuing frustrating experience of the Navy in fabricating a coastal minehunter hull. The stresses that must be faced by seagoing ship structures are, of course, much greater than those encountered by pleasure craft, and there is obviously much room for development before glass-reinforced plastic (GRP) can be substituted for major hull structures on large commercial vessels.

Following the lead of the aerospace industry, however, naval engineers and naval architects can now take advantage of the lower weight and greater ease of maintenance of a variety of sophisticated composite materials for use in engineering subsystems. Most marine applications for composites have employed polymer-based substances that have evolved from the original GRP laminates introduced some 40 years ago, but there is ample room for developing shipboard materials based on metal, ceramic, or carbon-based composites.

A recent paper by the Navy's George F. Wilhelmi ["Composite Materials for Ship Machinery Applications," Society of Naval Architects and Marine Engineers, June 1988] lists as the advantages of using shipboard composites: strength, stiffness, light-weight, fatigue resistance, corrosion resistance, improved damping, dimensional stability, domestic availability, automated processing, non-magnetic properties, and tailorable compositional properties. Wilhelmi gives as ship performance benefits increased payload, range, or speed; improved stability, efficiency, and availability; and reduced acoustic signatures, maintenance, and life-cycle costs.

Ongoing Navy shipboard composite development projects range from the fabrication and testing of an entire propeller shaft to absorb up to 53,000 horsepower on a fleet replenishment ship, to wider applications of composite ventilation ducting, pumps, fans, piping, and heat exchangers. The use of composite propeller shafting in naval vessels would significantly reduce their magnetic signatures, through elimination of the eddy currents created by rotating metallic propeller shafts. All of the concepts would also have direct applications for commercial vessels.

There are doubtless many breakthroughs to come in the development of new structural materials for use in ships. The Soviet Union, for example, which generally leads the West in metallurgical developments, has been using titanium alloys for over two decades for everything from submarine pressure hulls to pipework. The Soviets have also successfully employed low magnetic signature aluminum-steel alloys in ships since the late 1950s, and the West Germans are confident enough of their ability to fabricate stainless steel that a new series of mine warfare ships is being built from it in preference to the more traditional wood or GRP.

In another area, fiber-optic communications hold the promise of removing many tons of copper cabling from naval vessels, permitting redundancy of communications circuitry and a major reduction in overhead cable bundling volume; although less dramatic in effect, there would be advantages in using fiber-optics on commercial vessels as well, especially in view of the increasing use of computers for machinery and cargo monitoring on such ships.

Not all of the innovative materials applications discussed above are of use in commercial vessels, of course, but naval applications will continue over time to find commercial counterparts aboard merchant ships.

XI. SHIPYARD PRODUCTIVITY IMPROVEMENTS:

Shipyards in the United States are almost universally acknowledged to be among the world's most expensive in the commercial marketplace, but the "high" cost of American labor is by no means the sole factor in that condition; several European shipbuilding nations now pay average shipyard labor rates higher than those prevailing in the United States, and even Japan's shipyard labor costs are fast approaching those of Europe and the United States. Also playing a major part in the poor productivity of United States shipyards are the prevalence of antiquated and ill-arranged facilities, the high cost of obtaining construction funds and materials, the declining shipyard equipment supplier base, and managerial inefficiencies.

The Maritime Administration has estimated that, since 1970, the United States shipbuilding and ship repair industry has invested approximately $4.1 billion in facility improvements. During Fiscal Year 1987, United States shipyards invested only about $150 million in upgrading and expanding their facilities and, due to the projected shrinkage in the naval market and the virtual cessation in commercial shipbuilding work, the industry was expected to spend $100 million less on capital improvements during Fiscal Year 1988. Most of the investment, however, has been in the acquisition of capital goods and property and has been tailored to specific construction or repair programs, mainly government originated. Very little of the considerable funds expended, therefore, has been devoted to the development of new ways of accomplishing construction or repairs. Additionally, much of the new shipyard equipment has been purchased from foreign suppliers. The rate of new investment is declining and is well below the level needed to sustain the effectiveness of the shipyard base even at its current depressed level.

Innovative financing and managerial initiative are beyond the scope of the subject matter of this paper, however important they may be to the potential resurgence of the United States maritime industries. What can be discussed, however, is the need for even further adaptation of proven foreign construction techniques.

United States shipbuilders have long been aware of the advantages of zone prefabrication techniques, and there are many yards that have invested in importing Japanese management and technology to implement more efficient flow of materials and components. In general -- and especially among those yards most successful in winning major Navy construction contracts in recent years -- there has been a strong commitment to capital equipment modernization. Computer-controlled cutting and welding equipment, automatic coating equipment, and the latest in European material handling equipment can be found in most surviving shipyards.

Productivity improvements, in other words, have taken place in the United States shipbuilding industry. But the virtual disappearance of orders for seagoing merchant ships has unfortunately coincided with the emergence of another major development that would make it possible for United States shipyards to build ships less expensively: the "producible ship." The essence of the producible ship innovation is the concept that ships should be designed from the outset for ease and efficiency of production. Its application abroad, particularly in the Far East, is one of the major reasons that American yards, despite a relative and even real decline in labor costs and the investment of millions of dollars in new fabrication equipment, still find it impossible to compete on the world commercial shipbuilding market.

One reason for the lack of consideration for producibility in United States commercial and naval ship designs has been the separation of the design agencies from the shipyards themselves. Either independent naval architectural organizations or, less often, designers on the staffs of ship owners have been the principal source of designs. The personnel in the design organizations are rarely intimately familiar with or sympathetic to the problems of the shipbuilder in turning their concepts into steel structures. The separation of functions is at variance with the practices of the more successful shipbuilding nations, where shipyards normally either have their own in-house design offices or work very closely with naval architectural firms to ensure that ships can be built and operated efficiently. The use of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) equipment, although greatly speeding the design process, does have the effect of further distancing the designer from the ultimate product.

The problem of inadequate productivity in United States shipyards is primarily organizational in origin, not the result of a lack of modern hardware, according to a 1984 study by Bruce J. Weiers for the Department of Transportation. Weiers's conclusions have been supported by subsequent independent analyses.

Although United States shipyard management is well aware of the modern production organization methods of process lane work flow and zone/area/stage outfitting, actual conversion of the management process to take advantage of the productivity enhancing concepts has been very slow. With the cessation of commercial shipbuilding in the United States, there is, of course, little need to adapt yards to modern construction methods (especially as the remaining naval construction work is, in effect, performed for a captive customer, the United States government). If an infusion of federal capital is employed to fund a renewed commercial cargo vessel construction effort (as in the Commission on Merchant Marine and Defense's recommended "Procure and Charter" proposal), the opportunity to revolutionize United States shipbuilding operational management should be an integral part of the program.

Current shipbuilding-related research and development in the United States is kept barely alive through the minimally-funded National Shipbuilding Research Program, from which the Maritime Administration has withdrawn support after Fiscal Year 1988. The United States Navy continues to fund the NSRP, but only provided $500,000 in Fiscal Year 1988, much of which went to cover administrative overhead. Other Navy programs under the ManTech (Manufacturing Technology) rubric provided about $11.7 million for research and development in 1988, including: an automated manufacturing research facility ($4 million), automation of propeller manufacture ($1.7 million), fire-resistant non-metallic structure research ($345,000), ultrasonic weld testing ($400,000), robotic welding ($700,000), laser metal welding ($2.3 million), a productivity center for metal working ($2 million in Fiscal Year 1988, with $4 million requested in Fiscal Year 1989), and welding process planning ($300,000). Needless to say, it is not a major effort, despite its being in support of a Navy shipbuilding program averaging over $9 billion annually.

XII. CONCLUSIONS:

In its 1985 publication R&D in the Maritime Industry, the Office of Technology Assessment (OTA) summarized its findings on the state of technology and research in the United States maritime industries:

> . . . OTA found that the U.S. generally has lagged behind foreign competitors in applying technological advances to much of the U.S.-flag fleet and to the technology of

> constructing ships. OTA [concludes] that to achieve a competitive position in world shipping and shipbuilding, it is important for the United States to regain technological preeminence in these areas.

During the three years since that opinion was stated, the little maritime industries-related research and development that had been underway in this country has all but evaporated. A survey conducted in 1985 by the Office of Technology Assessment showed that, of the responding firms, 42 percent of the shipyards and 63 percent of the ship operators had financed no significant research and development for the previous five years. Ship owners, faced with massive worldwide overtonnaging, have been loath to invest scarce resources in research and development, preferring to purchase new technology off-the-shelf from abroad whenever the introduction of new ideas can be justified on competitive grounds.

The commercial shipbuilding industry, in far worse economic condition than the ship owners and faced with little likelihood of future newbuilding orders, is in no financial position to risk significant capital on research and development ventures.

The Reagan administration, believing that maritime research and development should be handled by the private sector (although, curiously, continuing to fund very significant research and development efforts in other modes of transportation), has virtually ceased to back any maritime industry-related effort whatever.

The Office of Technology Assessment's prescription for a more effective federal government role in maritime research included:

> 1) Defining the need for research and development as part of an overall federal maritime policy;
>
> 2) Determining what portion of the maritime research and development effort might best be performed by the private sector and then providing indirect incentives to ensure that the research and development is carried out;
>
> 3) Stimulating coordination and transfer of technology within the maritime industry and from military, foreign, and other sources;
>
> 4) Devoting government maritime research and development to high-risk or long-range problems in support of national goals; and
>
> 5) Establishing new or modified institutional arrangements to encourage, coordinate, and

> foster maritime research and development with federal and/or private support.

In its second report, the Commission on Merchant Marine and Defense recommended:

> The Department of Transportation should actively encourage cooperative and shared research and development (R&D) funding efforts between the maritime industries and the government in order to identify and implement innovative and creative ideas to improve the efficiency and international competitiveness of the United States maritime industries while improving the usefulness of the merchant marine for national defense requirements.

The necessity for federal government involvement in maritime research and development is clear. Cooperation between the government agencies concerned and the remaining industry elements is necessary to achieve any degree of concentration of effort and level of funding required to produce meaningful results. Such cooperation is the rule among the leading foreign maritime nations, and the results of foreign maritime developments have been, as described in the paper, highly beneficial.

BIBLIOGRAPHY

Beargie, Tony, "China's Shipyard: How Big a Threat After 1990?", *American Shipper*, October 1987, p. 82.

Beargie, Tony, "Japanese Yard Outproduces American 2-1," *American Shipper*, October 1987, pp. 78-80.

Baker, Don C., "Publisher's Notebook," *The Journal of Commerce*, Wednesday, April 20, 1988.

Bingham, V. P., and Thomas P. Mackey, "High-Performance Rudders -- with Particular Reference to the Schilling Rudder," *Marine Technology*, October 1987, pp. 312-320.

Blaurock, J., "Propeller Plus Vane Wheel, an Unconventional Propulsion System," International Symposium on Ship Hydrodynamics and Energy Saving Unconventional Propulsion Systems, Paper IX-2, El Pardo, Spain, September 1983.

Bong, H. S., William Hills, and John B. Caldwell, "Methods of Incorporating Design for Production Considerations into Concept Design Investigations," in *Proceedings, Thirteenth Ship Technology and Research (STAR) Symposium*, SNAME, Pittsburgh, Pennsylvania, June 8-10, 1988.

Bosworth, Michael L., and Clark Graham, "Producibility as a Design Factor in Naval Ships," *Journal of Ship Production*, Vol. 2, No. 2, May 1986, pp. 90-100.

Brett, Per Olaf, Stein Gaarder, Geir Thorseng, and Truls Vaa, "Operational Aspects in Ship Design: The Case of the Roll-on/Roll-off Vessel," in *Proceedings, Thirteenth Ship Technology and Research Symposium*, SNAME, Pittsburgh, Pa., June 8-10, 1988.

Brown, David K., R.C.N.C., *The Value of Reducing Ship Motions*, unpublished third draft, Bath, England, January 3, 1984.

Canna, Elizabeth, "The Next American Presidents," *American Shipper*, May 1988, pp. 12-14.

Cullison, A. E., "Japanese Will Design Superconductive Ship," *Journal of Commerce*, June 27, 1988.

Cullison, A. E., "Mitsui's Quiet Propeller is Fuel Efficient, Too," *Journal of Commerce*, October 23, 1987.

David Taylor Naval Ship Research and Development Center, Annapolis, "Electric Drive Program," pamphlet, Annapolis, Maryland, 1988.

Davies, John, "Designer Lauds Concept of Super-Barge Carrier," Journal of Commerce, October 14, 1988.

Eastin, Keith E., "Tributyltin Paint -- the Navy Perspective," Sea Technology, March 1987, p. 69.

Elliot, Frank, "Navy to Demonstrate Newfangled 'Podded Tractor Drive' for Ships," Navy News and Undersea Technology, June 6, 1988, p. 1.

Gallin, C., E. Terorde, and G. Versock, "A New Concept for 'Neat Fit' Ship Propulsion," in Proceedings, Thirteenth Ship Technology and Research (STAR) Symposium, SNAME, Pittsburgh, Pennsylvania, June 8-10, 1988.

Gearhart, W. S., Advanced Propulsor Design Studies, Pennsylvania State University Applied Research Laboratory Technical Note TN 85-153, Pennsylvania State University, State College, Pennsylvania, September 1985.

Goldstein, Michael, "Technology Benefits Shipper," The Journal of Commerce, April 19, 1988.

Gruson, Lindsey, "Barnacle Repellant Faces Ban as Marine Hazard," The New York Times, March 22, 1987.

Hamada, Dr. Noboru, "Japanese Advances in Transport Technology,", Sea Technology, February 1988, pp. 25-29.

Horowitz, Rose A., "Opposition Stalls Tariff System," The Journal of Commerce, June 2, 1988.

Ingvason, Sigurdur, Donald N. McCallum, and CAPT Gilbert L. Kraine, USCG (Ret.), "An Integrated Hull Design: Performance and Producibility," Naval Engineers Journal, May 1986, pp. 58-73.

Kaellstroem, Claes G., Peter Wessel, and Sven Sjoelander, "Roll Reduction by Rudder Control," in Proceedings, Thirteenth Ship Technology and Research (STAR) Symposium, SNAME, Pittsburgh, Pennsylvania, June 8-10, 1988.

Keane, R. G., et al, Ship Efficiency Improvement Technical Review, NAVSEA Report Number 051-50-TR-0005, Naval Sea Systems Command, 1987.

Keane, Robert G., Jr., The Stepchild of R&D: The Displacement Monohull, Association of Scientists and Engineers of the Naval Air and Sea Systems Command, Washington, D.C., March 1978.

Knee, Richard, "Super-Sized Vessels," American Shipper, December 1986, pp. 62-66.

Langenberg, Hans, "Hull Form Design -- Only a Matter of the Computer?" in Proceedings, Thirteenth Ship Technology and Research (STAR) Symposium, SNAME, Pittsburgh, Pennsylvania, June 8-10, 1988.

Lewis-Jones, Trevor, "Sealift and the Merchant Marine," ME/Log, October 1987, pp. 57-59.

Malone, John A., Gary Baham, and John J. Slager, Energy Conservation Program: Development Plan for a Naval Ship Service Power Simulation Model, NAVSEA Tech Note 051-55W-TN-0004, Naval Sea Systems Command, Washington, D.C., July 1983.

Maritime Administration, MARAD '87: The Annual Report of the Maritime Administration for Fiscal Year 1987, U.S. Department of Transportation, Washington, D.C., May 1988.

Mattson, Wayne S., "Shipboard Energy Savings with the RACER System," Naval Engineers Journal, February 1982, pp. 63-69.

McCallum, Donald N., Innovations in Monohull Design, NAVSEA Technical Note 55W3-85-001, Naval Sea Systems Command, Washington, D.C., 1985.

Mitsui Engineering & Shipbuilding Co., Ltd., "Air Resistance Reduction Tent (ART) Developed for Energy Conservation in Navigation; First Tent Installed in a 4,700-Vehicle Car Carrier," MES Bulletin, MZ 860702-854, Tokyo, Japan, 1986.

Office of Technology Assessment, An Assessment of Maritime Trade and Technology, OTA-O-220, U.S. Congress, Washington, D.C., 1983.

Office of Technology Assessment, R&D in the Maritime Industry: A Supplement to an Assessment of Maritime Trade and Technology, OTA-BP-O-35, U.S. Congress, Washington, D.C., May 1985.

Russell, James A., "New Fuel Saving Engine Eyed," Navy News & Undersea Technology, January 31, 1988, p. 3.

Russell, James A., "Navy Eyes Electric Drive Engines for New Ships," Navy News & Undersea Technology, January 3, 1986, pp. 1-2.

Saunders, CAPT Harold E., USN, "The Multiple-Skeg Stern for Ships," Society of Naval Architects and Marine Engineers Transactions, 1946, pp.97-169.

Seideman, Tony, "Shipping Still an Infant of Electronic Interplay," The Journal of Commerce, March 30, 1988.

Thomassoni, C. A., and J. J. Slager, Energy Conservation R&D Program for Hull and Appendage Hydrodynamics, NAVSEA Report 3213-80-07, Naval Sea Systems Command, Washington, D.C., March 1980.

Weiers, Bruce J., *The Productivity Problem in United States Shipbuilding*, DOT-TSC-OST-84-2, Transportation Systems Center, U.S. Department of Transportation, Washington, D.C., December 1984.

Wesenberg, Bob, "Largest Cruise Ship Step Closer to Reality," *Journal of Commerce*, July 7, 1988.

Wilhelmi, George F., "Composite Materials for Ship Machinery Applications," SNAME New Technologies Affecting Marine Machinery paper, STAR Symposium, Pittsburgh, Pennsylvania, June 10, 1988.

Winkler, Matthew F., "The Performance and Durability of Ceramic Fire Deck Coatings in Diesel Engines," SNAME New Technologies Affecting Marine Machinery paper, STAR Symposium, Pittsburgh, Pennsylvania, June 10, 1988.

Yoder, Stephen Kreider, "Japan Plans Speedy Superconductor Ships," *The Wall Street Journal*, August 17, 1988, p. 16.

______, "And Soon, the Six Person Crew?," *Marine Log*, May 1988, pp. 19-22.

______, "CRPs for Large Ships Developed in Japan," *Marine Log*, September 1988, p. 75.

______, "Energy Saving Devices," *MARIN Report*, Maritime Research Institute Netherlands, No. 26, September 1986, p. 276.

______, *GE Marine Gas Turbines for World-Class Cruise Liners*, General Electric Corporation pamphlet, 1987.

______, "MARCHEN MAERSK's 5,000," *Containerization International*, June 1988, p. 5.

______, "New Coating Stimulates Boatbuilding Interest," *NAVY International*, March 1988, p. 157.

______, "New Propeller Boss Cap Fins Provide Significant Improvement in Efficiency," *ME/Log*, September 1988, pp. 61-62.

______, *Strengthening Research and Innovation in the Maritime Industries*, Marine Board, Commission on Engineering and Technical Systems, National Research Council, Washington, D.C., 1987.

______, *Spey Marine Propulsion Gas Turbine*, Rolls-Royce Limited, Ansty, Coventry, England, September 1985 --pamphlet and data sheets.

______, "TBT-Free Antifoulings for Economy," *The Motor Ship*, August 1988.

______, The Roles of Government and Industry in Research and Development for the Maritime Industries, Marine Board, Commission on Engineering and Technical Systems, National Research Council, Washington, D.C., 1986.

______, Toward More Productive Naval Shipbuilding, Marine Board, Commission on Engineering and Technical Systems, National Research Council, Washington, D.C., 1984.

______, "WID May Save Tanker 6% on Fuel Bill," ME/Log, August, 1987, pp. 32-33.

APPENDIX E-5

INTERMODALISM

INTRODUCTION:

In a report published in 1987, "Strengthening Research and Innovation in the Maritime Industries," the Marine Board of the National Research Council (NRC) stated:

> Where U.S. maritime industries have become more competitive or enhanced national security, it has been for one of two reasons. Either they have increasingly integrated their maritime activities into an overall system (. . . integrated transportation system in the case of shipping and ship operating), or they have reaped maximum benefits of technology transfer from other U.S. industries and from abroad, or both.

The "integrated transportation system" the NRC was talking about is a system built on intermodalism, a system of transportation that defines the movement of cargo as a door-to-door rather than port-to-port service, and that normally employs unitized containers to carry the cargo. Through intermodalism, transportation efficiency is enhanced by having a single carrier coordinating the movement and documentation among different modes of transportation, such as trucks, railways, barges, or oceangoing ships.

The potential of intermodalism may represent not only the future for the United States flag merchant marine, but also an opportunity greatly to expand United States trade and productivity. Expansion could benefit all members of the United States intermodal industry as additional marketing opportunities are made available.

Intermodalism involves not only the movement of goods between and among various modes of transportation but also distribution -- the managing of the overall economics of the total move, including all the related domestic and foreign segments. Intermodal transportation offers the American shipper an integrated, single international and domestic transportation network with a wide range of service capabilities available (for example, fast customs clearance made possible by computer interface between carrier and customs). Furthermore, cargo is delivered with sufficient dependability to allow customers to employ Just-In-Time (JIT) techniques to reduce inventory or shorten the manufacturing cycle, with the transportation system serving as a pipeline. Additionally, intermodalism offers the shipper opportunities for saving money and improving marketing and distribution of goods.

Intermodalism has resulted in a transportation system with immense potential for productivity improvements that have not been completely realized or even identified. Landbridge intermodal service across the United States (linking the Orient, European, and American markets) offers most shippers employing that route the advantages of faster travel and less damage to materials than shipping via the Panama Canal. The low rates, fast schedules, damage-free rides, and instantaneous electronic shipment tracing now available in the major stack-train lanes are projected to spread to the shorter, secondary truck routes. Intermodalism will almost certainly expand beyond its transcontinental niche to become the universal North American shipping medium of choice.

The spread of intermodalism in the United States has been greatly assisted by deregulation. The elimination of regulatory barriers among transportation modes has allowed the industry to focus on the cargo rather than on the mode. Accordingly, most members of the intermodal transportation industry appear to agree with Thomas Jefferson that the sum of good government is "a wise and frugal government, which shall restrain men from injuring one another, which shall leave them otherwise free to regulate their own pursuits of industry and improvement, and shall not take from the mouth of labor the bread it has earned."

To exploit the promise of intermodalism, and to provide for improved communications between government and industry, the Commission on Merchant Marine and Defense recommended in its second report that the Department of Transportation should establish a Task Force on Intermodal Transportation Policy and Development to assist and support advances in intermodalism. The proposed Task Force would include, at a minimum, senior representatives from or individuals experienced in intermodal transportation companies and facilities, organized labor, the Marine Board of the National Research Council, and Secretarial-level representatives from the Departments of Commerce, Defense, Justice, Labor, and Transportation, under the chairmanship of the Department of Transportation.

THE COMMISSION'S INQUIRY:

To invite comments on the Commission's activities and to solicit responses to six major questions about intermodalism, the Commission staff mailed letters in February 1988 to heads of representative transportation companies and to other leaders in representative sectors of the intermodal transportation industry. Although the total number of participants involved in the survey was relatively small, the conclusions are, nonetheless, informative:

SECTOR	NUMBER QUERIED/ NUMBER RESPONDING	PERCENT RESPONDING
Multimodal Transportation Companies	5/2	40%
Steamship Companies	9/7	78%
Railroad Companies	5/4	80%
Ports	19/12	63%
Other Related Businesses (such as equipment and periodicals)	11/2	18%
Total:	49/17	55%

A total of 27 responses was received. One response was of a general nature and did not address any of the intermodal questions. Of the 26 respondents answering some or all of the questions, the responses can be summarized as follows:

Question 1: Do you believe that the federal government has a role in the advancement of intermodalism? If so, what should that role be?

Yes:	24 (92%)
Ambivalent:	2 (8%)

Respondents were almost universal in their belief that the role of the government should be the removal of barriers to intermodal transportation at all levels and standardization of the rules and regulations that remain. "Deregulation" was the order of the day; regulation was viewed as one of the great inhibitors to intermodalism. The proper role for government was seen as one of promotion, not of regulation. Some respondents expressed the belief that a primary federal role should be in financing infrastructure improvements and in persuading shippers that intermodalism provides the best means of transportation for their cargoes.

Question 2: Do you believe that a Task Force on Intermodal Transportation Policy and Development, as proposed by the Commission, would be beneficial?

Yes:	15 (58%)
No:	7 (27%)
Ambivalent:	2 (8%)
Not Addressed:	2 (8%)

The attitude of respondents who agreed that a Task Force on Intermodal Transportation would be beneficial is summarized in the words of one respondent:

> "We therefore believe the suggestion by the Commission that DOT establish a task

> force . . . is a sound idea. We also agree . . . that the task force include representatives from the public and private sectors. This would serve as an ideal forum to explore the issues . . . including how to assure the necessary capital to meet the demands of capital intensive transport systems, how to assure uniformity of regulatory requirements, and how to properly coordinate the efforts of federal, state, local, and private interest."

Those who did not favor the Task Force tended to view it as unnecessary or perhaps even as government meddling, implying that the private sector has done well so far and needs no official interference.

A Task Force on Intermodalism, such as recommended by the Commission, could provide an effective forum for the exchange of ideas between the private sector and government agencies for the formulation of, among other things, effective programs for the advancement of intermodalism. The Commission specifically did not recommend that such a task force be used as an instrument for enabling increased governmental meddling in the private sector to promote the inefficient and hamper the efficient. The Task Force could create an environment favorable to promoting intermodal transportation and to optimizing the productivity of government involvement. The ultimate government objective should be the maintenance of a transportation system responsive to the needs of the nation in time of war or national emergency.

Question 3: Do you believe that regulatory differences among transportation modes increase cost and serve to negate advancements in intermodalism? If so, what unnecessary laws and regulations should be revised or deleted?

Yes:	8 (30%)
No:	10 (38%)
Ambivalent:	1 (4%)
Not Addressed:	7 (27%)

Those who cited regulatory differences as a problem pointed, in the main, toward the lack of standardized regulations among the states, such as over-the-road weights, lengths, and widths; rules for tandem trailers; and differences in intra- and interstate requirements. One respondent cited intermodal rates set by two different agencies, the Interstate Commerce Commission and the Federal Maritime Commission, for two different trades. Most respondents, however, indicated that deregulatory actions by the federal government, for both surface and sea transport, had served to eliminate many problems. Again, the message that deregulation has led to the greatest advancement of intermodalism was loud and clear.

Question 4: Do you believe that there is a need for a single regulatory agency, such as a National Transportation Commission, to implement all regulation of transportation required by law?

Yes:	4 (15%)
No:	11 (42%)
Ambivalent:	6 (23%)
Not Addressed:	5 (19%)

As indicated, most respondents flatly rejected the idea or were ambivalent. One respondent stated, "With regard to a regulatory agency, we believe this could be a possibility; however, the key focus should be to reduce regulation rather than change organizations." Another wrote, "It would seem a singular body to implement all regulation of transportation required by law would be more efficient. However, I believe the magnitude of such an undertaking would be enormous."

Question 5: Do you believe that there is a need for more strategic planning in the area of intermodalism at the state, regional, and federal levels to coordinate the expansion of the various intermodal components and their respective facilities (roads, rails, air, ports, and ships)?

Yes:	12 (46%)
No:	2 (8%)
Ambivalent:	6 (23%)
Not Addressed:	6 (23%)

The majority agreed that more strategic planning is required. In the words of one respondent:

> It would seem that additional emphasis on strategic planning in the area of intermodalism at the various governmental levels would be worthwhile. The various state ports authorities have spent large sums of money to improve the interface of rails and trucks with vessels. Some states have allocated funds for improvement of clearances impeding highway and rail intermodal conveyance. However, there is a lack of coordination at times that results in improvements at origin and destination of the intermodal move, but little has been done to tie the two together. Adjoining states could certainly be more aware of their neighbor's efforts to improve clearances, highways, access to terminals, etc., and work more closely together to attain a system that complements each other's efforts to the mutual benefit of all concerned.

In summary, most respondents appeared to say that if an integrated cargo system is the goal, then better ways to fit the transport modes together must be found and that the process must involve increased strategic planning at all levels.

Question 6: Do you believe that there is a need for a federal agency, organized to exploit the advantages of intermodalism, to provide coordination, financial, and other assistance for intermodal development, and to promote the rational public policy needed for capital intensive intermodal improvements?

Yes:	4 (15%)
No:	10 (38%)
Ambivalent:	7 (27%)
Not Addressed:	5 (19%)

Agreeing with the need for a federal agency, one reply said:

> In the abstract, intermodalism should be exploited at the Federal level . . . but I do not believe there should be financial incentives provided to a specific company to do x or y -- rather, if the Federal government wanted to fund a particular new transport mode for the potential use of all carriers, or a new piece of intermodal equipment built under prototype bidding, etc. that is acceptable, but in the final analysis if the Federal government keeps an arm's length from the private sector -- regulating when needed, stepping aside when necessary, encouraging research and development -- the rational public policy needs for capital investments in intermodalism will take place.

The majority, who disagreed, saw a "federal agency exercising guidance which all too often turns into control over the private sector transportation companies." Several respondents recommended a task force approach rather than a "new federal agency," while others believed this mission could be adequately filled by the Department of Transportation _if_ it were to be fully supported by the administration and the Secretary of Transportation.

CONCLUSION:

The potential of intermodalism may represent the future for the majority of United States flag liner companies. To that end, the federal government should do all in its power to promote the advancement of intermodalism and to support the creation of integrated multimodal transportation companies.

APPENDIX E-6

SHIP REGISTRY ISSUES

Ship registry provides a means of national identification for merchant vessels for purposes of establishing sovereignty and accountability. Many years ago, ships owned and operated by nationals of a country flew the flag of that country exclusively. During the past seventy years, however, it has become the practice to "flag" ships under foreign registries in order to gain economic advantages such as lower rates of taxation, relaxed insurance requirements, lower crew costs, and less stringent safety regulations.

The practice of "flagging out" merchant vessels has resulted in far more ships owned by citizens of the major Free World trading nations being registered in the so called "flag of convenience" nations like Liberia or Panama than fly the flags of the nations of their owners. In early 1988, nearly 7,200 ships totaling over 216 million deadweight tons, some 34 percent of the world's merchant fleet tonnage, were registered in open registry nations. United States citizens own around 39 million deadweight tons of the world total of open registry ships, nearly eighty percent more merchant tonnage than is registered in the United States.

The issues of the "beneficial ownership" of merchant ships, the accountability of those ships, and the responsibilities of the maritime nations to protect "their" fleets have become so complex that it has been seriously proposed that all merchant vessels should fly the same flag, that of the United Nations. The spectacle of Kuwaiti owned tankers being reflagged to United States registry so as to enjoy the protection of the United States Navy, while United States owned tankers flying the flags of Liberia or Panama were being freely attacked in the Persian Gulf, focused acrimonious attention on registry issues.

Since the 1920s, United States merchant ship operators have been making wide use of the registries of Panama, Liberia, and, to a much decreased extent in recent times, Honduras as flags of convenience. In recent years, the Bahamas has been added to the list. To ensure that the United States owned tonnage under the four foreign flags is available for national defense purposes in time of mobilization, agreements were worked out with those nations so that there are theoretically no restrictions to the United States government gaining control of the vessels when and if they are needed. United States owned ships on the four registries are frequently referred to as the "EUSC" ("Effective U.S. Controlled") fleet. Ships on the "EUSC" registries are eligible for United States government war casualty insurance in return for their owners signing agreements to make the ships available when needed.

Nonetheless, whether "EUSC" ships would really be available in time of war or national emergency has remained an issue, kept alive, understandably, by United States maritime labor unions, who see the "EUSC" system as depriving their members of opportunities for employment, and by people who are concerned that the predominantly foreign crews of the "EUSC" ships might not prove loyal or reliable in a crisis. The growing dependence of the United States on a rapidly reactivatable reserve cargo ship fleet for strategic sealift has highlighted the problem, for the diminished United States registry no longer has enough billets to guarantee that a sufficient number of trained United States citizen mariners would be available to operate the Ready Reserve Force and Military Sealift Command Reduced Operating Status vessels.

The Tax Reform Act of 1986 removed most of the tax advantages to United States nationals of owning "EUSC" ships, since foreign earnings of United States controlled shipping are now taxed, even if reinvested. As a result, the net cost of a new "EUSC" ship is expected to be 50 percent more than that of an identical replacement vessel in a non-United States controlled fleet, and "EUSC" owners are expected to move many of their assets to nominal foreign ownership under non-requisitionable non-"EUSC" flags.

Two other issues confront the use of "EUSC" shipping for strategic sealift purposes. The first is that, for military purposes, the majority of the fleet has little utility, the ships being either too large or too specialized in function. In addition, in response to a Congressional request instigated by maritime labor, on April 14, 1988, the General Accounting Office (GAO) rendered an opinion that "EUSC" ships may not be requisitionable simply on the basis of ownership by foreign subsidiaries of United States corporations and suggested that alternative legal arrangements might provide the necessary basis. The Department of Transportation does not concur with the GAO opinion but is working with the ship owners to clarify any alternative legal arrangements under which "EUSC" ships might clearly be requisitionable.

The problem of control over national shipping assets has also affected the strategic sealift capabilities of virtually all of the European allies of the United States, whose national fleets are rapidly shrinking as owners take advantage of the growing number of open registries. National crews have been replaced with Third World and even Communist nation mariners. Indeed, so rapid has been the decline of the British registry that, were the Falklands Conflict to occur today, Britain would lack the sealift resources that enabled her to win in 1982; since 1980, the British registry has lost two-thirds of its ships and four-fifths of its tonnage.

To stem the outflow of ships from their national registries, many of the major maritime nations have taken steps ranging from providing tax relief incentives to owners, through the decrease or elimination of income taxes on merchant seamen (as has been done in Sweden and Great Britain), to giving permission for the hiring of a certain percentage of a ship's crew from low-cost foreign sources (a measure currently being considered in Japan). The most frequently employed measure, however, has been the establishment of an "offshore" registry, either under the same flag as the parent national registry (such as the Norwegian International Registry and the new Danish International Ship Registry) or under the nominal aegis of one of the parent nation's overseas territories or dependencies (such as Great Britain's Isle of Man, Hong Kong, Gibraltar, Cayman Islands, and Turks and Caicos registries; the Netherlands Antilles Registry; or France's Kerguelen Islands Registry).

The principal benefit of the offshore registries to the owners has been the reduction in operating costs inherent in being able to hire crews in part or entirely from among Third World nationals. Not surprisingly, the principal objection to such registries has come from the maritime labor organizations affected but, faced with the prospect of no jobs at all, there has been no instance where labor has thwarted creation of an offshore registry.

The offshore and open registries currently in existence or being given serious consideration for establishment are listed in Table 1 at the end of this Appendix.

Several authorities have suggested to the Commission on Merchant Marine and Defense that the establishment of a United States offshore shipping registry would be a useful means to improve the competitive position of the nation's merchant marine. Other people have expressed fears that the creation of a United States offshore registry would further erode our already inadequate sealift resources. Such a registry would permit the ships under it to fly the flag of the United States and to receive all of the benefits of United States registry; the ships would, however, be free, to some as yet to be defined extent, of certain of the current requirements of the standard United States flag registry. If such a new United States offshore registry allowed vessels to be economically competitive, it would probably attract United States owned ships currently registered under foreign flags, both "EUSC" and non-"EUSC."

In response to a Commission on Merchant Marine and Defense staff request, a major United States operator of open registry shipping offered as the essential elements of a United States offshore registry that it include:

-- Majority United States ownership and management;

-- Prohibition against offshore registry ships operating in domestic trades, with "Jones Act" ships remaining under the original United States registry;

- Permission to use Capital Construction Fund money for financing new vessels built in either United States or foreign yards;
- Requirement that construction and operation of ships be to internationally recognized design and safety standards;
- Freedom from taxation on corporate earnings from the operation of the offshore registry ships;
- Rapid depreciation and low taxation on earnings remitted to owners;
- Exemption from federal and state taxation on the earnings of what would be a 100 percent United States citizen crew, with the amount of money that would normally have been withheld from wages to pay crew income taxes being retained by the vessel owners;
- Manning at minimum levels consistent with safe vessel operation as certified by the United States Coast Guard; and
- Relief from what are considered by owners to be excessive and onerous liability laws and insurance rates.

The expert who submitted the list of requirements considered that a United States offshore registry thus formulated would likely be economically competitive in the international market, minimizing or eliminating the need for federal government subsidies to be paid to the ships registered under it. Because the United States offshore registry would provide for 100 percent United States citizen manning, it would theoretically increase the number of mariner billets available as United States owners of "EUSC" and non-"EUSC" offshore registry vessels switched to the new registration.

In a provisional assessment of the concept, the United States State Department provided the following views to the Commission:

> 1. The U.S. international registry would have to offer advantages commensurate with other international registries (low fees, minimal manning and fringe benefit costs, and ease of registration) if it is to attract operators. Both U.S. national security requirements and marine employment objectives suggest that

> consideration be given to requiring at least one or two U.S. crewmen (including perhaps a U.S. master) with the mix determined by the skills required for national security.
>
> 2. Operators in the international registry should not be eligible for the same level of USG [United States Government] assistance [as are regular U.S. registry ships], if indeed they were eligible for any.
>
> 3. Eligibility for preference cargoes would, similarly, have to be either denied or on a more restricted basis than that accorded [standard registry] U.S.-flag carriers, perhaps a second-tiered preference linked to non-availability of [standard registry] U.S.-flag vessels.
>
> 4. U.S. interests in maintaining current crew employment levels would require that Jones Act trades be closed to the international-flag operators and the existing coastwise trade regime left untouched.
>
> 5. For operators wishing to participate in both registries there would probably have to be a requirement to maintain some objectively-fixed employment level under the existing U.S.-flag [registry] as a condition for the registration of any new ship in the offshore registry in order to ensure there would be incremental additions to the overall employment level.

There are obviously a number of issues that would have to be settled, probably including others not listed above, before the establishment of a United States offshore registry could be recommended or formulated. Nonetheless, if for no other reason than that such registries are rapidly proliferating among maritime nations whose merchant marines are faced with the same problems that confront the United States merchant marine, the concept deserves thorough and serious study.

Table 1

CURRENT AND PROJECTED OFFSHORE AND OPEN REGISTRIES
(* Proposed registries)

Registry	Ship Age or Other Restrictions	Crew Nationality Restrictions	National Ship Survey Office
Antigua	None	No Restrictions	None
Bahamas	Up to 12 years (can be extended)	No Restrictions	Yes
Belgium*	Not Available	Not Available	Not Available
Bermuda	None	Officers U.K., Commonwealth, or Irish	Yes
Canada*	Not Available	Not Available	Not Available
Cayman Islands	None	No Restrictions	None
Cyprus	Up to 17 years	15% Cypriot or tax levy in lieu	None
Denmark	None	Danish only	Yes
Gibraltar	Ships over 15 years are subject to inspection	U.K. Master; also 1st Officer, if calling at Gibraltar	Yes
Hong Kong	Inspection, if over ten years	Master, Chief Eng., Radio Off. must be U.K., Commonwealth, or Irish	Yes
Isle of Man	None	Certification by U.K., Ireland, or Commonwealth	Yes
Kerguelan	No crude tankers	Four officers and 25% crew French	None
Liberia	Up to 20 Years	No restrictions	Yes
Luxembourg*	Not Available	No restrictions	Not Available
Malta	None	No restrictions	None

Table 1 (Continued)

Registry	Ship Age or Other Restrictions	Crew Nationality Restrictions	National Ship Survey Office
Marshall Islands	Not Available	No restrictions	Not Available
Netherlands Antilles	None	Master Dutch (waiver obtainable)	Not Available
Norwegian Internat'l	None	Master Norwegian (waiver obtainable) and union agreement	Yes
Panama	None	No restrictions	Yes
St. Vincent	Up to 40 years	No restrictions	None
Singapore	Less than 15 years	No restrictions	None
Sri Lanka	Up to 20 years	50% Sri Lankan	None
Turks and Caicos	None	Master, Chief Eng., & 1st Officer U.K., if calling at U.K. ports	None
Vanuatu	Up to 20 years	No restrictions	None
West Germany*	Not Available	Not Available	Not Available

Note: Registries for countries without a national marine survey organization will accept surveys performed by recognized classification societies.

APPENDIX E-7

THE UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT CODE OF CONDUCT FOR LINER CONFERENCES

BACKGROUND:

On April 6, 1974, the United Nations Conference on Trade and Development (UNCTAD), a permanent organ of the United Nations, adopted a code to govern liner conference ocean shipping. On April 6, 1983, nearly a decade later, the Code had been ratified by the required number of signatories, and on October 6, 1983, it went into effect. Estimates of the share of total world trade that fall under the provisions of the Liner Code range from less than 10 percent to more than 25 percent.

Third world members of UNCTAD were the principal proponents of the Liner Code, seeing it as a means to change existing practices in ocean shipping. They believed that practices by established maritime powers hindered third world trade by developing countries and prevented the growth of their merchant fleets. To solve the perceived problem, the developing countries promoted the Liner Code, which provides certain rights and safeguards for them in world shipping. The major trading countries, however, have not welcomed the Code. Many of the major countries, including the United States, are not party to the Code, and the few that have ratified the document have qualified their approval.

The United States is the strongest opponent of the Code. United States law regulating ocean shipping is consistent with the Liner Code on some provisions but is inconsistent on other, critical, provisions. For example, United States regulation of ocean commerce is based on open competition among all vessels (although the United States has cabotage laws that restrict coastal transportation to United States built and registered ships and has an extensive system of government-owned and government-impelled cargo preference laws); the Code's provisions are based on preference for national-flag vessels. The United States has taken the position that restricting the choice of vessels will lead to higher rates and less efficient service; the supporters of the Code state that restricting the choice of vessels is necessary to develop the fleets of the developing countries.

Note: U.S. Shipping Policy and the Liner Code of the United Nations Conference on Trade and Development, by Lenore M. Sek, Congressional Research Service, Library of Congress, was of considerable value in the preparation of this paper. Very useful assistance was also provided to the Commission staff by the Department of State.

Although not inclined to change its current position on the Code, the United States may have to be flexible in its reactions. Depending upon the actions of other countries, United States companies that are involved in international shipping could ultimately be adversely affected by continued United States intransigence toward adherence to the Code.

LINER CODE PROVISIONS:

The Code begins with the following statements of objectives and principles, which were accepted by all signatory countries:

> (a) The objective to facilitate the orderly expansion of world sea-borne trade;
>
> (b) The objective to stimulate the development of regular and efficient liner services adequate to the requirements of the trade concerned;
>
> (c) The objective to ensure a balance of interests between suppliers and users of liner shipping services;
>
> (d) The principle that conference practices should not involve any discrimination against the shipowners, shippers, or the foreign trade of any country;
>
> (e) The principle that conferences hold meaningful consultations with shippers' organizations, shippers' representatives and shippers on matters of common interest, with, upon request, the participation of appropriate authorities;
>
> (f) The principle that conferences should make available to interested parties pertinent information about their activities which are relevant to those parties and should publish meaningful information on their activities, ...

The main provisions of the Code are the articles following the statements of objectives and principles. Some articles are compatible with United States law; others are not.

Article 1 concerns conference membership. It states that carriers of any two trading countries must be allowed membership in a conference that is transporting cargo between the two countries. Conference members will decide whether cross-traders (vessels that are registered in a country other than either of the trading partners) can join a conference.

Article 2 deals with conference decisions on sharing trade among members. It states that, under certain circumstances, carriers of the two trading countries have the right to carry equal shares of cargo. For example, in trade between two countries, if one country's carriers in a conference have a certain percentage of the trade, then the other country's carriers in the conference have the right to the same percentage. Cross-traders in the conference, "if any," shall be allowed a significant part, "such as 20 percent," of the trade. Article 2 has been interpreted widely as reserving 40 percent of the trade between countries for the shipping lines of the two trading countries and 20 percent for cross-traders. Under the provisions of the Code, however, the actual percentage can be negotiated between the two trading countries. Article 2 is one of the most controversial parts of the Code because cargo sharing has been opposed by most of the developed countries.

Article 3 specifies that all members of a conference shall have equal roles in deciding conference matters and that members from each of the trading partners must agree upon conference decisions. United States law differs by giving no special status for the national carriers of the trading partners.

Articles 4 to 10 are not controversial and in general seem to be compatible with United States law. They discuss withdrawal of a member from a conference, self-policing by a conference, availability of conference documents and tariffs, loyalty arrangements (an agreement that a shipper will use a certain conference), release of a shipper from a loyalty arrangement, and conference obligations to file reports.

Article 11 provides for mandatory consultation between shippers and carriers whenever desired by a conference or shippers. It means that, if a shipper wants to consult a carrier about rates or any other matter, the carrier must agree to a consultation. The article outlines subjects for consultation, deadlines for conferences to have consultations, and other pertinent subjects. The article requires advance notice before decisions are taken on rates and other matters. Government agencies may participate in the consultations but may not take a decision-making role. United States law has no provisions similar to those in the article.

Article 12 details criteria for determining freight rates. It states that freight rates should be fixed as low as is commercially feasible and still permit a "reasonable profit." It discusses other factors to be considered in rate setting and directs that special consideration should be given to developing and land-locked countries in setting rates to promote certain exports. The United States objects to the article on the question of the definition of "reasonable profit." The term is ambiguous and could be defined in several different ways.

Article 13, in a manner similar to United States law, states that conferences shall not charge shippers different rates to the detriment of one or more of the shippers. It also states that conferences must adhere to published tariffs, and that tariffs should be as clear as possible.

Article 14 addresses increases in general freight rates. It states that conferences shall give shippers notice at least 150 days in advance before increasing freight rates and that shippers may request consultations with the conferences. The article provides for mandatory conciliation on rates. It also states that, unless negotiated otherwise, rate increases shall not be proposed again until the most recent increase has been effective for at least 10 months. The 150 day notice period plus the 10 month waiting period, therefore, mean a minimum term of 15 months between freight rate increases, unless agreed otherwise. Article 14 is highly controversial, and United States law allows a much shorter period between increases. Supporters of Article 14 say that the 15 month period deters frequent and unnecessary rate increases; opponents say that, under Article 14, rates would not be able to change with market conditions and, thus, when rates finally could increase, the increase would probably have to be large to compensate for the waiting period.

The rest of the articles cover various, generally less important, topics. Articles 15 to 22 concern promotional rates, temporary surcharges, changes in freight rates in response to changes in exchange rates, "fighting ships" (a conference-employed vessel that charges extremely low rates to drive out non-conference competition), service on trade routes, conference representation in the trading countries, and conforming language. Articles 23 to 46 contain provisions and machinery for settlement of disputes. National governments of shipping firms may become involved in settlement of disputes. There is no provision for enforcement of decisions. Articles 47 to 54 are miscellaneous articles related to Code implementation.

Many of the Code's provisions were non-controversial and were generally agreed upon, but others, in particular the cargo sharing provisions of Article 2, divided UNCTAD's members. Although the Code allows for extensive negotiation on many of its provisions, world opinion is split, making widespread implementation uncertain.

Three resolutions were added to the Code when it was passed. One, contained in the three paragraphs below, was especially noteworthy because it was intended to provide safeguards for non-conference carriers so that they would not be hurt by the Code and would continue to compete with conference carriers:

> 1. Nothing in . . . [the Code] shall be construed so as to deny shippers an option in the choice between conference shipping lines

and non-conference shipping lines subject to any loyalty arrangements where they exist;

2. Non-conference shipping lines competing with a conference should adhere to the principle of fair competition on a commercial basis;

3. In the interest of sound development of liner shipping service, non-conference shipping lines should not be prevented from operating as long as they comply with the requirements of paragraph 2 above.

DISCUSSION:

The current United States administration, along with the previous three, has followed a policy of opposing the Liner Code, strongly believing that it would have wide-reaching, unfavorable consequences for the economy of the nation as a whole and would not prove beneficial to the economies of the developing nations.

The Liner Code proceeds from a philosophy completely at odds with the traditional economic principles embodied in United States law. United States shipping policy has historically recognized the necessity of encouraging free and fair competition as the best way to provide an efficient, low-cost transportation system to support United States foreign commerce.

UNCTAD, in contrast, designed the Liner Code primarily as an instrument to promote the shipping interests of developing countries and to curb Western influence in the shipping conferences serving developing countries. Like most UNCTAD shipping initiatives, the Liner Code provides for extensive government involvement to promote a regulated international economy that subordinates trade to transport. As part of the UNCTAD's "New International Economic Order," the Code gives each developing country the inherent right to carry a portion of its foreign trade, notwithstanding the resulting increased costs and inefficiencies.

United States flag liner operators, owners of ships in the "Effective United States Controlled" ("EUSC") fleet, shipper organizations, and bulk operators (who, although not directly affected, oppose the Code on principle), have supported the United States government in its opposition to the Code. They believe that, if the Code is adopted, it would effectively restrict United States access to liner cargoes and would promote shipping inefficiencies due to extensive government intervention, as appears to be the case with some bilateral cargo sharing agreements now in effect.

Opponents have argued that adoption of the Code would lead to much more ominous consequences than a quick reading of the intent and major provisions would indicate. Because the UNCTAD Code is vague, many opponents believe that conferences operating under the Code will evolve into closed trades without the benefit of independent carriers (which are not given any status) competitively to force efficiency. In addition, the Code provision to allow cross traders, "if any," to carry a share of trade, "such as 20 percent," appears to be designed to eliminate cross traders whenever possible. Finally, the Code is criticized for not having any provisions or rewards for carrier efficiency, with the possible consequence that, if closed trade with revenue pooling is practiced as indicated, inefficiency would produce the greatest reward to carriers.

Not all United States interests have opposed the Code. Some have argued that traditional competition in our maritime liner trades no longer exists and that our liner cargoes are being carried increasingly by foreign flag vessels of state owned fleets. Additional arguments in support of the Code include that a combination of passage of Shipping Act amendments, United States access to cargo through the Code, and the use of United States financial incentives could lead to encouraging foreign (and United States) investment in liner shipping.

The American maritime unions (in particular District No. 1 MEBA/NMU and the Seafarers International Union) have consistently voiced strong support for the Code.

The response to the Liner Code from other major trading nations has been ambivalent. The European Economic Community (EEC) eventually authorized its members to ratify the Code with reservations. That response appeared to be an attempt to limit the potential damage of the Code while coming to grips with the need to recognize the legitimacy of the rights of the EEC's third world trading partners. The EEC reservation, or "Brussels Package," as it is called, exempts from the provisions of the Code all trade among members of the Organization of Economic Cooperation and Development (OECD). It also opens to all members of the OECD that portion of the bilateral trade of a member and a third world nation other than the third world nation's share under the Code (in other words, 60 percent of any liner trade between an OECD country and a third world nation is available to all OECD nations). The effect of the Brussels Package would be substantially to reduce the effect of the Code on world trade as well as to eliminate the cargo reservation benefits that some proponents of the Code seek.

The cargo sharing provisions of the Code are both the core of the Code's obligations and the principal, though not exclusive, basis for United States opposition. Successive Administrations have held that, under the Code's cargo sharing regime, shippers would lose the ability to choose the service that best meets their needs and that costs would be raised by the restraint of competition. In turn, the higher transport costs would feed domestic inflation and burden the United States balance of payments as imports became more expensive and exports less competitive. Moreover, many developing countries that are parties to the Code do not have sufficient tonnage to carry their share of the cargo; practical experience shows that they are not willing to give up any cargo sharing rights, thereby creating further inefficiencies.

The current United States administration does not believe that the Brussels Package would overcome the problems the Code's cargo sharing provisions pose to the United States. The administration argues that the Brussels Package would not offer material benefits to United States carriers or shippers because it is simply irrelevant to the majority of our trade. Neither the United States nor its major trading partners contemplate applying cargo sharing in intra-OECD trades. These trades accounted for 63 percent of United States international commerce in 1987. Secondly, there are a number of significant non-Codist trading partners in the developing world -- Taiwan and Singapore, for example -- to whom the Code and the Brussels Package would also not apply.

In trades where the Brussels Package applies, OECD cross-traders would be able to compete for 60 percent of the conference share instead of the 20 percent they would otherwise be limited to under the Code. It is not clear whether, or in what circumstances, the supporters of the Brussels Package would apply its reciprocity requirement to deny United States carriers, operating as cross-traders, the right to participate in the OECD's member's 40 percent share. In any event, 40 percent of trades governed by the Brussels Package would still be reserved for the national lines of the developing country, whether or not the shipping lines offered reliable and efficient service.

According to the administration, a further and more important drawback to United States adherence to the Code and the Brussels Package is that it would sharply limit the kinds of relief that carriers and shippers could seek under United States law. The assurances of market access available to United States shipowners and shippers under United States law are broader in scope and more effective than any improvements the Brussels Package could offer on the Liner Code. The United States has long relied on Section 19 of the Merchant Marine Act of 1920 to ensure access to our trades for United States and foreign shippers and carriers. Experience with Section 19 demonstrates clearly that it can be an effective and reasonably flexible tool.

In addition, Section 13(b)(5) permits the United States to take action against measures aimed at excluding United States carriers from cross-trades, including cargo sharing arrangements between countries that have signed the Code whether or not supplemented by the Brussels Package. Action under Section 13(b)(5) would afford United States carriers access to all cross trades, not merely the 20 percent allowed under the Code or the 60 percent foreseen by the Brussels Package. The vigilant and judicious applications of Section 19 and Section 13(b)(5) are at once the primary reason the United States does not need the Code and the best defense against the Code's potential abuses. United States adherence to the Code and the Brussels Package could inhibit United States carriers from relying on United States law to pursue remedies inconsistent with Code obligations.

The United States administration also has substantial doubts that the Brussels Package is consistent with member country obligations under the OECD's "Code of Liberalization of Current Invisible Operations." Under that Code, OECD countries are obligated to "give residents of one Member State the unrestricted opportunity to avail themselves of, and pay for, all services in connection with international maritime transport which are offered by the residents of any other Member State." All OECD member countries other than the United States are also enjoined from "preferential shipping clauses in trade agreements."

Intergovernmental cargo sharing agreements applying the Liner Code do not appear to the United States to be consistent with the obligations. In addition, the Brussels Package test of reciprocity runs counter to the OECD Code's requirement for nondiscriminatory treatment of all OECD member states. The question of the consistency of the Liner Code with OECD Code concerns a number of non-Codist OECD countries, including Japan, which has elected indefinitely to postpone its ratification of the Liner Code.

Although the cargo sharing provisions represent perhaps the best known features of the Code, other elements, such as the closed conference system predicated by the Code and the inflexible regulations for adjusting freight tariffs, conflict with basic and long-standing United States principles. The Code also calls for a considerable amount of government involvement in deciding conference membership, controlling negotiations between shippers and conferences, and setting freight rates. Under United States laws and regulations, however, conferences are permitted a large degree of self-management.

CONCLUSIONS:

For the immediate future, there is little prospect of changes in the Code that might make it more acceptable to the United States. UNCTAD is convening a Review Conference in November 1988 to assess the effects of the Code and to consider proposed amendments. The changes, however, as put forward for consideration by the UNCTAD Secretariat, envisage an even greater intrusion in the free market for shipping. Beyond a greatly expanded role for government, the UNCTAD Secretariat also wishes to regulate nonconference shipping and to create an "UNCTAD Bulker Code."

The entire structure of the UNCTAD Liner Code may, over time, become moot in any case, for it appears that there is a good possibility that the current system of liner conferences may break up, at least on the major trading routes across the Atlantic and Pacific.

The current position of the United States government toward the UNCTAD Liner Conference Code of Conduct is that, with the Code's current provisions for interference with the free market for shipping and the aspirations of some of the Code's signatories to restrict competition further, United States agreement to sign is not possible.

APPENDIX E-8

PREPOSITIONING: OBJECTIVES, STATUS, AND EFFECTS

BACKGROUND:

Prepositioning, defined as the advance placement of equipment, supplies, ammunition, petroleum, and water in critical regions of the world in anticipation of the possible deployment of forces, is one of the three components of the strategic mobility triad, along with sealift and airlift. Since the late 1970s, the concept of prepositioning has received continued increasing emphasis in force commitments and in the programming of resources.

The President's 1988 report National Security Strategy of the United States states the following about the need for maintenance of strategic global support and mobility capabilities:

> The ability to reinforce and resupply forward deployed forces is essential to the execution of U.S. military strategy.
>
> Our global support and mobility capabilities, including airlift, sealift, and prepositioning, are therefore essential to allow us to meet military challenges. . . . Prepositioning ashore or at sea can sharply reduce our response times.

DISCUSSION:

The Commission's initial assessment of strategic sealift requirements and resources, as reflected in its first report, was based on a "best case" baseline analysis and evaluation. Consequently, the cargo movement requirements provided to the Commission by the Department of Defense reflected the assumptions that all planned prepositioning objectives would be met and that prepositioned designated cargo would generally not compete for intertheater strategic lift in a global or single theater contingency. Given those assumptions, the Commission still found that:

> There is today insufficient strategic sealift, both ships and trained personnel, for the United States, using only its own resources as required by defense planning assumptions, to execute a major deployment in a contingency operation in a single distant theater such as Southwest Asia.

The Commission is nonetheless acutely aware of significant shortfalls and delays in meeting prepositioning objectives, especially in Prepositioned Organizational Material Configured to Unit Sets (POMCUS) and in Prepositioned War Reserve Materiel Stocks (PWRMS) for the European Command. In March 1988, General Thomas C. Richards, Deputy Commander-in-Chief, United States European Command (speaking on behalf of his Commander-in-Chief, General John R. Galvin), in testimony before the Readiness, Sustainability, and Support Subcommittee of the Senate Armed Services Committee, made these remarks [emphasis added]:

> We remain, however, unable to meet fully our reinforcement commitment to NATO. . . . This is the result of continuing shortages in a number of required, interrelated areas: readiness and availability of support units; POMCUS fill; strategic lift; theater war reserve stocks of preferred munitions, equipment, spare parts, deployable medical systems and medical supplies; availability of warehousing to support prepositioning and other theater storage programs. . . .
>
> War stoppers are those Prepositioned War Reserve Materiel Stocks (PWRMS) that are identified as absolutely essential to sustaining conventional combat through the first days of the war and whose current in-theater stockage levels are significantly below established requirements. European Command's current war stopper list includes items within all classes of supply.
>
> A critical aspect of the theater's deterrence capability is the ability to reinforce rapidly. . . . The purpose of POMCUS is to forward position equipment for six CONUS [Continental United States] based divisions ear-marked to reinforcing Europe, so that in time of crisis only unit personnel and a minimum of equipment, will require airlifting to Europe. Over the years, the POMCUS program has continually improved, yet there is still a lot of equipment to be procured and prepositioned. As we proceed to increase the fill of POMCUS, and we would make adequate progress with the FY 89 Budget support, we also proportionally reduce the requirements for air and sea lift. Completing the POMCUS program will reduce significantly the number of aircraft and ships required to support the initial reinforcement effort. If mobilization occurred today, a substantial portion of our lift requirements would be

> dedicated to transport equipment and supplies that are scheduled but not yet prepositioned in POMCUS.
>
> Given this significant POMCUS shortfall, the U.S. military does not have sufficient air or sea lift to place the required forces in Europe to meet our national reinforcement commitment.

In an Army Times newspaper interview in 1986, Lieutenant General Colin L. Powell, then serving as Commanding General, V Corps, in Germany, and now the National Security Advisor to the President, offered responses to prepositioning related questions and issues:

> Question: "Given that you would need replacements . . . and . . . logistical support fast from the States, in a major outbreak of fighting, are you worried about the supply line back to [the] States?"
>
> Answer: "Obviously, I'd be foolish, not to be concerned about the ability of the American armed forces to ship equipment overseas and sustain supplies. In the first instance, POMCUS . . . and airflow will hopefully take care of the immediate surge of additional combat and combat service support that is needed."
>
> Question: "Do you have a good reason to believe that the POMCUS sets are going to be there long after the whistle is blown? In time for people to use them?"
>
> Answer: "I hope that, when hostilities begin, the POMCUS sites will already be empty."

It is clear from those and other statements that prepositioning, in conjunction with the rapid response capabilities of the United States Armed Forces, in fact enhances deterrence -- that is, assuming established goals and objectives are met. It is equally important to understand, however, that unfulfilled goals and objectives, or shortfalls, diminish the credibility of the prepositioning concept. The President's 1987 report National Security Strategy of the United States states: "Deterrence is the most fundamental element of our defense policy. . . . Deterrence can best be achieved if our defense posture makes the assessment of war outcome by the Soviets, or any other adversary, so dangerous and uncertain as to remove any possible incentive for initiating conflict" [Emphasis added].

Although there are considerable shortfalls in critical prepositioning programs, as disclosed in General Richards's testimony before Congress, the Department of Defense has not in the past officially recognized or planned for the lift of the shortfall tonnages in its strategic lift requirement assessments. It has been the position of the Department of Defense that prepositioning shortfall items do not become a lift requirement because most of the items have not yet been procured and that, moreover, once the items have been procured they will forthwith be prepositioned as planned.

Recently, however, the Commission has been advised that the Department of Defense has begun some evaluations of the effect of prepositioning shortfall requirements on strategic mobility assessments. It should be noted that, in his testimony cited earlier, General Richards specifically mentioned the fill of prepositioning shortfalls as an additional lift requirement in a contingency situation. Whether or not the United States can meet its initial NATO commitment to provide ten divisions within ten days of a mobilization decision remains a crucial issue. The commitment is a significant cornerstone of the deterrence strategy of the NATO alliance, yet it is generally agreed that the commitment cannot be met.

Prepositioned stocks in the Southwest Asia and Pacific areas are at a significantly higher level of fill than in Europe; providing sufficient lift to make up for shortfalls in the Southwest Asia and Pacific areas would therefore be significantly less difficult to achieve than in the European theater.

CONCLUSIONS:

The concept and underlying philosophy of prepositioning are sound but, as in other areas of military readiness, unmet goals and objectives may seriously degrade the effectiveness of prepositioning as a major element in the overall defense posture and capabilities of this country and its allies, especially in NATO. Perceived force projection weaknesses, real or imaginary, erode the credibility of deterrence.

The United States remains committed to NATO to deploy ten divisions within ten days of a mobilization decision. If significant prepositioning shortfalls, especially in POMCUS, remain unresolved, it is entirely possible that resources available in the continental United States that substitute for non-procured POMCUS items would be made available for deployment. If such an eventuality materializes, there would be insufficient sealift and airlift to meet the added requirement. Although the Department of Defense has not in the past officially recognized or planned for the additional lift requirement, current prepositioning shortfalls could increase the number of ships required for sealift by as many as 75 to 80, based on a one-voyage requirement for each ship.

Given the gravity of the issues, a more practical and realistic approach may be needed to meet the nation's requirements for strategic mobility in view of the current significant shortfalls in meeting prepositioning objectives. Current strategic mobility assets are insufficient, even assuming full prepositioning. The insufficiency is further magnified if a realistic assessment of lift requirements is performed by evaluating current prepositioning shortfalls and the subsequent need to fill the requirements.

Adequate strategic mobility capability is a key element of credible deterrence and therefore should be properly assessed and addressed in real world, as well as planning scenario, terms.

Although the issue of prepositioning shortfalls is currently planned by the Department of Defense to be resolved over the next several years, the trend toward tightened fiscal constraints may cause significant shortfalls to continue over an extended period. That eventuality could have a critical effect on the numbers of sealift resources that would be needed for adequate strategic mobility in the long term, since in order to make up for prepositioning shortfalls it may be necessary to provide an even greater sealift capacity than is currently estimated to be required.

APPENDIX E-9

CONTAINERIZATION: ITS POTENTIAL AND IMPLICATIONS FOR MILITARY REQUIREMENTS

BACKGROUND:

Containerization is defined as the use of containers to assemble, into a single load, more than one package of one or more different line items of cargo in such a manner that the load can be moved in an unbroken state from source to distribution point or user as far forward in the supply system chain as is practical. The concept incorporates supply, security, packaging, documentation, storage, and transportation.

The first significant Department of Defense (DOD) wartime or contingency experiences with containerized shipping came during the Vietnam War. A comprehensive 1970 DOD Joint Logistics Review Board (JLRB) study and analysis provides considerable insight into the Vietnam containerization experiences and their implications, as shown by the following excerpts from that study:

> The Department of Defense has always been, and remains today, largely dependent on the commercial ocean carriers for movement of military cargo in peacetime as well as wartime. The Department of Defense policy, broadly stated, is that if fairly priced commercial services can meet the military requirement, full use will be made of commercial resources. Since commercial operators are converting from breakbulk ships to container ships, it is clear that in the future the bulk of maritime shipping furnished by the merchant marine to the Department of Defense will consist of containerized ships.
>
> Full exploitation of containerization throughout the Department of Defense offers major challenges and rewards. The challenges are associated with programming and managing the resources toward the end of optimizing military logistic operations for the future. The rewards involve manifold improvements in the economy, efficiency, and responsiveness of future logistic operations of a yet to be determined but certainly substantive magnitude. The comprehensive reassessments of supply, transportation, and logistic systems doctrine of the Services associated with containerization are not unlike the perturbations induced by containerization in the commercial distribution industry. The

> Department of Defense challenge of the moment is "how" as opposed to "why".
>
> The DOD and the Services must move to exploit rather than react to the potentials of containerization. The economies to be derived through containerization in the military services' logistic systems leads to an urgent requirement for a bold commitment toward container-oriented military logistic systems.

Following the Vietnam experience, the Department of Defense has been impelled by the trends and emerging technology in the container and ocean carrier industry, including developments in intermodalism, increasingly to use containers for military ocean freight.

DISCUSSION:

The current stated policy of the Department of Defense is that "DOD components attain and maintain a container-oriented distribution system of sufficient capability to meet DOD-established mobilization and deployment goals while ensuring the interchangeability of intermodal containers, hardware, and equipment between the Military Services and commercial industry, which collectively constitute the DOD container-oriented distribution system."

To determine how and to what extent the Department of Defense has capitalized on the Vietnam-derived experiences and subsequent developments in containerization for meeting deployment goals, the Commission staff conducted limited reviews of key DOD component program plans and study initiatives that consider some of today's most critical DOD containerization issues, as briefly described below:

Determining the Extent to Which Unit Equipment Lends Itself to Containerization: The issue is under extensive study within the Department of Defense. The effect of containerization on major unit closures, based on the use of a combination of ship types (including container ships, modified container ships with sea sheds, roll-on/roll-off cargo vessels, and other types of dry cargo ships), is included among the primary study efforts. For example, preliminary analyses have shown that roughly 60 percent of the equipment used by Army mechanized infantry divisions and as much as 92 percent of the equipment used by Army light infantry divisions can be accommodated in heavy duty flatracks aboard container ships.

Containerized Ammunition Distribution: The concept was successfully tested and used in Vietnam. Continued peacetime experimentation has enhanced the concept, leading to the exploration of several current issues, including the greater use of various commercial containers for ammunition shipments; the reassessment of inspection, security, safety, and blocking and bracing requirements; the reassessment of port and terminal loading ("outload") capability; and the potential capability for configuring container loads to enhance specific distribution objectives. Several additional issues involve ongoing joint service cooperation in developing greater interoperability among the services' intermodal or containerized shipment strategies, cargo handling equipment, and information management systems.

Doctrine for Containerization in Ship-To-Shore or Logistics-Over-The-Shore (LOTS) Operations: Employment of containerization in LOTS operations calls for both conventional and non-conventional shipments. Container ships are expected not only to carry regular containerized equipment and supplies but also to carry essential LOTS support systems, such as the Container Offloading and Transfer System (COTS). The COTS will include the Army/Navy Modular Causeway System, made up of 40 foot by 8 foot by 4.5 foot modules that are fitted with standard container fittings so they can be stowed aboard container ships and handled with standard container handling equipment. The COTS and other systems will facilitate the offloading of regular conventional cargo for delivery to the shore and beyond. Although progress is being made in development of better LOTS equipment support systems, such as the Modular Causeway, offshore operations and productivity still are adversely affected by the sea state, weather, and surf conditions of the operating environment.

DOD Container Requirements Determination: The identification of DOD container requirements and the availability of assets to meet those requirements are matters for continuing study and monitoring. DOD programs involve requirements and assets for both service-specific needs and the common-user requirements in the Defense Transportation System. Although certain mission requirements will dictate the development of unique containers not found in the commercial market, the great majority of the sizes and types of containers needed are expected to be available from the commercial sector.

There is, nonetheless, some indication that the availability and suitability of the assets in the commercial sector may not always have been properly evaluated by the Department of Defense. The challenge is to ensure that an effective and reliable mechanism exists between the Department of Defense and the private sector to provide for the timely identification of requirements or needs, to establish a sound funding policy for acquisition through development and/or execution of procurement or leasing arrangements, and to provide for adequate management, control, and utilization of acquired resources.

Container-Oriented Distribution Concepts, Doctrine, and Operations: Since Vietnam, logistics support systems and concepts have undergone transformations in concert with the formulation of new force deployment and employment concepts and the attendant development of new DOD force structures and modernized equipment inventories. Doctrinal concepts and operational procedures for container-oriented distribution have evolved to some degree among all elements within the logistics pipeline, from source to destination. The related issues, as they pertain to the containerization evolutionary process, include major installation outload capability and resources; personnel training and exercise participation; in-theater movement and control policies; and policies and procedures for the use of containers located in the theater of operations for return to the continental United States or some other location either empty or loaded (such "retrograde" operations have a bearing on the total number of containers needed to conduct a supply operation).

Transportability and Containerization: Transportability of equipment and materials is considered to be one of the keystones of strategic mobility. Container transportability considerations are essential in the DOD equipment acquisition process so that the benefits of intermodal transportation of containerized cargo can be fully realized.

The early recognition of transportability in the conceptual design of equipment is important, as are realistic tradeoffs between equipment capabilities and transportability. As an example, a recent preliminary assessment of the deployability of a new series of Army vehicles showed that the initial prototype designs were too large and/or too heavy, which was counterproductive to the effort being made to reduce the size of the individual pieces of equipment and to reduce, or at least not increase, overall transportation requirements for unit equipment deployment. A more recent example of how critical transportability considerations can be for strategic mobility assessments involves the Army's announced plans for a new M1 Abrams Main Battle Tank Block III for the 1990s. Concerns have already surfaced about the weight added to the tank by proposed new systems such as a new gun, new ammunition, and a new suspension that would obviously limit the options for deploying the new tank, considering the expected limited availability of future strategic mobility resources.

Aside from the tank issue, however, the general implication for containerization in transportability assessment is that smaller, lighter equipment is more compatible with containerization and is therefore more compatible with a greater variety of sealift and airlift resources.

Effects of Very Large Container Vessels: The trend toward larger, or "post-Panamax" (ships too large to travel through the locks of the Panama Canal), container ships in the United States flag fleet will force a reexamination of issues concerning the availability and flexibility of national defense port and terminal facilities and their loading capabilities, overseas discharge facilities and capabilities, and other military utility implications for strategic mobility.

The concept of containerization may be potentially useful for deployment of certain combat and combat service support units configured into modules that conform to standard International Standards Organization (ISO) container specifications. The modules could be deployed aboard regular container ships that would also serve as sea-based operating platforms for a variety of logistics support missions.

CONCLUSIONS:

Although the Department of Defense has made significant progress in some of the planning and research effort required to develop container-oriented distribution systems (for example, ammunition shipments, and prepositioned supplies and equipment) as a result of the Vietnam experience, there still remain, after almost two decades, challenging issues that must be resolved by the Department of Defense in order to achieve its current policy objectives. The issues, and their associated plans, programs, and projects, over a period of years tend to become casualties of budgetary constraints, higher priority concerns, and evolving changes to technology and doctrine.

The concept of the container-oriented distribution system is nonetheless inextricably interwoven into technological developments in the United States flag merchant fleet, primarily the container ship. A successful containerized military cargo system is, therefore, dependent upon a functioning privately-owned United States flag merchant fleet that will be readily available to perform strategic sealift services.

Containerization for strategic mobility purposes must be pursued and resolved in a timely, effective, and efficient way. The more the United States flag merchant marine's modern container ships are compatible with the Department of Defense's sealift requirements, the greater can be the reductions in expenditures for costly, specialized, government-owned resources. A proven "off-the-shelf" capability in peacetime facilitates a smooth and reliable transition to a wartime application.

APPENDIX E-10

OBSERVATIONS ON THE READINESS OF UNITED STATES PORTS FOR STRATEGIC MOBILITY MISSIONS

BACKGROUND:

From the beginning of the history of the United States, ports have played a key role in the nation's defense and economic security. Until near the end of the 19th Century, the country had to contend with battles on its own soil, together with the necessity to maintain ports to secure its shores and to receive supplies and personnel to prosecute the wars in which it fought. In the 20th Century, however, the United States has, by necessity, engaged in conflicts abroad, which has created the need and capability for the rapid movement of personnel, equipment, and supplies to respond to requirements in overseas areas of crisis. The need and the capability are now the essence of a forward-deployed strategy.

Evolving technologies in transportation, communications, and other areas during this century have had a profound effect on the way national policy and strategy are formulated and executed. Technological advances have progressively increased the need to maintain the ability, in keeping with the country's global commitments, quickly to deploy troops, equipment, and supplies to trouble spots in order to deter aggression or, should deterrence fail, to win wars.

In order to meet its global commitments, the nation must rely on its ocean sealift assets to move 95 percent or more of all required materials overseas, which clearly indicates the importance and magnitude of the role that ports would play in a major conflict.

In 1983, the General Accounting Office (GAO) issued a report entitled Observations Concerning Plans and Programs to Assure the Continuity of Vital Wartime Movements through United States Ports (GAO/NSIAD-83-18). The report expressed serious reservations about the ability of United States ports, which are potentially major choke points in the strategic mobility pipeline, to sustain large flows of military traffic during wartime. The surge of military cargo into ports during the early phases of a mobilization could require rapid adjustments to normal operations. If the ports have not been prepared through prior planning, bottlenecks will probably develop. Ports are also likely targets for disruption by clandestine attacks and sabotage. Should bottlenecks or disruptions occur, the strategic mobility advantages accruing from the acquisition of adequate and capable sealift resources would be eliminated.

DISCUSSION:

In keeping with its mandate to study the various aspects of strategic mobility and sealift problems, the Commission directed its staff to conduct a preliminary review of port readiness and sustainability issues. The review concentrated on the ability of United States ports to handle and expedite the flow of cargo through the strategic mobility pipeline so that resources could be used most effectively. Using the GAO report as a basic frame of reference, the Commission staff specifically sought to determine whether ports can handle large volumes of surge cargo movements; whether federal agencies, as well as state, local, and private sector interests, know their responsibilities and can coordinate and conduct operations effectively and efficiently; and whether adequate procedures and resources are available to assure security in the port complexes.

In order to assist in gathering facts and making determinations about the several issues cited, the Commission staff solicited responses to a number of questions from the principal agencies that have responsibilities in the areas of port planning and operations: the Military Traffic Management Command (MTMC), the Military Sealift Command (MSC), the Naval Control of Shipping Organization (NCSORG), the United States Coast Guard (USCG), the Maritime Administration (MARAD), and the United States Army Corps of Engineers (USACE). The Commission's questions and summaries of the responses received follow. Although most questions were asked of all respondents, there were several additional questions specifically addressed to selected agencies.

QUESTION: Do you receive or have access to adequate information (such as the volume of cargo and equipment to be moved, critical ports, time frames, etc.) to enable you to determine and plan for your port support and sustainability missions and activities during mobilization or war?

RESPONSE SUMMARY: Generally, adequate information is available to the several agencies involved. The principal system used to develop information is the automated Joint Operational Planning System (JOPS). Inputs to JOPS by various elements of the joint deployment community are ultimately processed to provide the detailed movement requirements to form the basis for necessary support planning. There is concern that some of the large scale JOPS planning data may be inconsistent with unit deployment plans; it is not known at this time, however, whether the inconsistencies would have any appreciable effect on planning.

QUESTION: Given restrictions on access to classified information by civil and private sector agencies, is there adequate peacetime involvement by the agencies in port contingency planning?

RESPONSE SUMMARY: Currently, restrictions on access to classified information pose no significant hindrances to civil and private sector involvement in the port contingency planning process. As port readiness activities expand to encompass more participation by private industry in major military exercises and other activities, it is anticipated that there will be a need for additional security clearances and access to classified data by persons from the private sector.

QUESTION: Have the Army (Military Traffic Management Command), the Coast Guard, the Navy (Military Sealift Command), and the Maritime Administration (MARAD) agreed on the definition of key ports for mobilization, and do all agencies operate from the same list?

RESPONSE SUMMARY: A specific annex to the official Port Readiness Memorandum of Understanding (MOU) among the principal agencies involved provides an agreed upon common list of ports to which all agencies can refer.

QUESTION (Selected respondents: The United States Coast Guard and the Military Traffic Management Command): Are sufficient and timely port threat assessments being conducted, and is intelligence information being provided to enable you adequately to plan for your port security mission?

RESPONSE SUMMARY: The following quotations summarize the responses:

United States Coast Guard:

> No. The lack of a credible threat effectively prevents us from performing planning, a problem recognized by other military planners outside the Coast Guard. Current analysis typically does not identify a major threat. Even an analysis that develops threat categories for planning purposes does not exist.

Military Traffic Management Command:

> Defense Intelligence Agency (DIA) is currently assessing requirements for port intelligence. If DIA is successful in funding support of the requirements it identifies, we anticipate improvements in the threat information to be provided in the post 1989 time frame.

QUESTION: Is there a contingency security identification system that will adequately provide for control and access to the

port complex for personnel from both government and the private sector in times of mobilization?

RESPONSE SUMMARY: Personnel access control at port facilities is primarily the responsibility of the Coast Guard, which currently uses a port security card program to provide for access. The Coast Guard has a new identification system under development to improve access control. MARAD and the MSC also have identification systems that complement the Coast Guard system, MARAD for Federal Port Controllers (MARAD's local designated agents) and the MSC for personnel requiring access to MSC ships.

QUESTION: Are current plans for backup or alternate ports sufficient to accommodate a variety of contingency situations, and are the plans evaluated in appropriate readiness exercises?

RESPONSE SUMMARY: There are plans in effect that designate sufficient alternate ports. Redundancy is designed into the planned use of ports. For example, each major deploying unit with a preassigned port has two alternate ports predesignated to provide requisite flexibility.

QUESTION: Have the roles and authorities of key agencies in all aspects of port readiness and sustainability been clearly and formally established?

RESPONSE SUMMARY: The Port Readiness Memorandum of Understanding (MOU) among all key agencies provides the basic documentation for their roles and responsibilities in all aspects of port readiness and sustainability. Additional initiatives, such as local port MOUs, exercises, and development of a prototype Port Mobilization Master Plan, are expected further to define and refine local peculiarities in roles, authorities, and agency interrelationships.

QUESTION: Are there statutory or regulatory constraints that preclude adequate and timely mobilization planning and execution of your responsibilities? What measures are or can be taken to offset their effects?

RESPONSE SUMMARY: Certain environmental and contracting laws impose constraints on the Army Corps of Engineers in that they do not provide for exceptions in emergency situations, which limits the Corps of Engineers' ability to respond effectively and flexibly in a contingency situation. Currently, safety rules and regulations constrain ammunition movement planning, which is further exacerbated by the lack of a West Coast containerized ammunition outload facility. The statutory "cap" on the number of Coast Guard reservists adversely affects the total number of dedicated personnel needed to carry out the Coast Guard's port security responsibilities at the port level.

QUESTION: **MTMC's "Ports for National Defense Program" provides a source of comprehensive data on significant port characteristics and an assessment of the capability of various ports to handle unit movement requirements along with consideration of the different types of vessel resources that may be available. In your view, to what extent does that analysis include evolutionary commercial port developments, such as increasing containerization, intermodalism, cargo handling equipment technology, and automated information and communications system technology? Is there an effective mechanism in existence to ensure that the national defense implications of port development strategies are recognized and assessed by both the federal government and the private sector?**

RESPONSE SUMMARY: The Military Traffic Management Command's "Ports for National Defense Program" primarily considers assessments of today's port capabilities to meet today's movement requirements. Nonetheless, there are other studies, analyses, and reviews that do look at evolving trends in the industry and do consider their implications for contingency port planning and for future operations. The Maritime Administration's "Port Facility Inventory" (PFI), a large automated data base, is another source of current port planning data on port facilities that is accessible to all key agencies.

QUESTION (Selected Respondent: **Military Traffic Management Command): Given that the private sector stevedoring or longshore labor pool generally does not include the same individuals from day-to-day, what are the implications for readiness and rapid deployment, considering requirements to operate various and sometimes unique types of military vehicles, to operate unique types of vessel loading systems (for example, the cranes and container spreader bars on the Fast Sealift Ships), and to operate automated cargo management information systems that necessarily require a reasonable level of familiarity and proficiency?**

RESPONSE: The Military Traffic Management Command responded:

> Through exercises like REFORGER, we continue to increase the pool of civilian stevedore companies with experience in our mission. Further, we supplement the general equipment handling capabilities of longshoremen with special skilled people in equipment operation through port support arrangements with U.S. Forces Command. Automated cargo data capture techniques improve readiness because they are easier to use than manual documentation.

QUESTION: **Do current mobilization exercise planning, operations, and participation provide sufficient involvement for**

the proper assessment of the readiness of all key players -- federal, state, local, and the private sector -- in port mobilization activities?

RESPONSE SUMMARY: Generally, port readiness exercises, together with participation by various activities in other contingency and mobilization exercises, do provide considerable opportunities for assessment of key players. Opportunities for greater and more extensive involvement are anticipated as initiatives such as the Port Mobilization Master Plan project are developed and put into effect.

QUESTION: What are the major obstacles to total port readiness and sustainability? Do you have suggestions, recommendations or proposals for corrective action?

RESPONSE SUMMARY: Port security and provision of the resources necessary to provide operating environments free of disruptive influences are of major concern. Limited funding for resources needed for planning, coordination, and exercise participation is a significant obstacle to total readiness. There is a need for a more comprehensive, secure, and integrated communications system for interagency and intraagency command and coordination requirements. Assessments of the effects of essential civilian and industrial cargo require attention in the context of overall port readiness evaluation.

CONCLUSIONS:

Compared to the 1983 GAO report assessment of the issues affecting the readiness of United States ports to handle mobilization or wartime missions, the Commission staff's review of key issues today finds significant improvements in most areas of concern. The National Port Readiness Network (NPRN), formalized and established among the key agencies involved in port readiness planning and operational execution over the past several years, has been a highly effective means to direct the necessary focus on coordination, communication, planning and action. Manifestations of those efforts are found, for example, in the execution of national and local level memoranda of understanding, establishment of local port readiness committees, the Maritime Administration's Federal Port Controller program and the related Port Emergency Operations Handbook, efforts toward development of a prototype Port Mobilization Master Plan, planning and execution of various exercises, cooperative studies and research, and other joint activities.

Among the foremost remaining concerns is port security. For very obvious reasons, the issue of inadequate port security cannot be allowed to languish. Positive steps must be taken toward effective and timely resolution. The American Association of Port Authorities (AAPA), which works closely with all levels of government on port issues of mutual interest, recently reaffirmed its resolution entitled, "National Assessment of The Wartime Vulnerability and Security Needs of U.S. Ports." The resolution states in part:

> NOW, THEREFORE, BE IT RESOLVED that the American Association of Port Authorities urges that the U.S. Department of Defense support and participate in the ongoing efforts to review the wartime vulnerability and security needs of U.S. ports (which should include an assessment of any existing planning efforts); and
>
> BE IT FURTHER RESOLVED that this review should be coordinated with all relevant federal (military and civilian), state and local law enforcement and security-related agencies, including public port authorities, and that upon completion of the assessment, a concerted effort should be undertaken to remedy any discrepancies and other security deficiencies identified in the process.

In order for the National Port Readiness Network to continue its momentum toward attaining total port readiness for any national security contingency, the additional issues of adequate funding, sufficient port material and manpower resources (including reservists), additional containerized ammunition loading capability, port labor productivity and training, a comprehensive communications network, and the effect of civilian cargo requirements also require serious attention by the responsible government officials.

APPENDIX E-11

MILITARY SEALIFT COMMAND TANKER SCHEDULING PRACTICES

In its second report, the Commission on Merchant Marine and Defense recommended that:

> The Department of Defense . . . should determine the benefits of using chartered tankers to meet overseas demands and spot charters for areas close to the continental United States.

The Military Sealift Command (MSC) has responded to that statement with the following comments:

> 1. The Military Sealift Command (MSC) operates its tankers to ensure timely and cost-effective delivery of petroleum products to worldwide DOD users and also provide for underway replenishment at sea of U.S. Naval operating forces.
>
> 2. To meet this mission, MSC operates a fleet of chartered U.S. Flag tankers capable of lifting approximately 90% of MSC's annual petroleum product lift requirements. The current tanker force is sized for effective annual tanker utilization and eliminates idle time.
>
> 3. During periods of heavy lift activity or as a result of increased emergency requirements in any particular part of the world, MSC augments the tanker force with single voyage charters (spots). Any suitable U.S. Flag tanker or barge available to effect any single voyage lift requirement has precedence over a foreign tanker. When possible, MSC schedules its controlled force in such a way as to ensure the uncovered requirements occur in areas where there are U.S. Flag tankers. When this occurs U.S. Flag tankers are provided the opportunity to offer to MSC for single voyage charters. This frequently occurs in the U.S. Gulf/Caribbean areas where these tankers are usually trading and may be available for charter. In other parts of the world and for reasons beyond the control of MSC, it is not always possible to obtain a spot charter of a U.S. Flag tanker who is free from cargo and available to lift the cargo within the required laydays.

In Fiscal Year 1987, the last full year for which data is available, the total amount of Department of Defense petroleum lifted was 10.1 million long tons (LT). The percentage of Department of Defense petroleum carried in foreign flag ships was 7.3 percent, a 25 percent decrease from the 9.8 percent carried on foreign flag ships in Fiscal Year 1986. The 742,000 long tons of petroleum carried on foreign flag tankers in Fiscal Year 1987 equates to employment of approximately two ship-years, almost all short inter- and intra-area voyages far from the continental United States.

Since the Department of Defense acquires its fuel from sources worldwide, often there are no United States flag tankers available for short notice lifts out of overseas refineries. As a consequence, there will probably always be a need for the Military Sealift Command to spot charter a small number of foreign flag tankers to meet its short notice lift requirements.

Nonetheless, there appears to be an opportunity for the Military Sealift Command to improve its scheduling procedures and to work with private industry to maximize availability and use of United States flag tankers. Some informed observers believe that MSC has not done as much as it can and should to monitor its tanker scheduling and to minimize the use of foreign flag tankers.

APPENDIX E-12

MOBILIZATION MANNING CONSIDERATIONS

BACKGROUND:

In time of national emergency, the manpower to mobilize reserve United States flag merchant ships is normally provided from actively sailing merchant seamen not currently at sea. There is a relationship among the number of active ships, the number of mariners employed in manning those ships, and the number of reserve ships that can be manned by the resulting pool of experienced seamen.

Statistical estimates, based on the current United States flag active merchant fleet, indicate that, on the average, 3.37 active ships are required to provide mobilization manpower to crew one reserve ship. By the year 2000, the active/reserve ratio will increase to 7.03 as a result of reduced crew sizes on active ships.

An analysis, contained in Appendix C-1, of the current merchant marine manpower situation indicates a shortfall of 175 merchant seamen in the specific skills of radio officer and unlicensed deck and engine personnel for mobilization manning of the 91 ships currently in the Ready Reserve Force (RRF) and the 10 ships in the Military Sealift Command's Reduced Operating Status (ROS) fleet. Additional personnel would be required to man all of the strategic sealift and economic support ships that would be necessary in a mobilization.

In order to meet wartime military sealift and economic support requirements, the Commission has recommended a total oceangoing fleet of at least 650 modern merchant ships in the privately owned United States flag commercial fleet, the Ready Reserve Force, and the Military Sealift Command Reduced Operating Status fleet. Because 133 ships are already programmed for the RRF and 10 ships are programmed for the ROS, an active commercial fleet of at least 507 merchant ships would be required to meet the Commission's goal.

CONCLUSION:

A 507 ship United States flag active commercial merchant fleet in the year 2000 would provide active manpower sufficient to crew only 72 of the planned 143 reserve ships and would leave a manpower shortage of more than 3,480 merchant seamen to man the remaining 71 reserve ships. Limiting the number of stewards on passenger ships during mobilization only to those required for food preparation for the ships crews and for supervision of food preparation by embarked troop units would reduce the manpower shortage to 2,817 merchant seamen.

The shortage could worsen if the active commercial United States flag fleet does not reach the 507 ship level, or if the reserve fleet is expanded beyond the currently planned level.

Even if the number of active United States flag ships were to reach the 507 ship level recommended by the Commission, some source of trained merchant marine manpower in addition to the pool of actively sailing merchant seamen would be required to enable mobilization of the entire reserve fleet. Although a civilian merchant marine reserve program is authorized by federal law, no civilian or military program is currently in place that can provide a sufficient number of trained and qualified licensed and unlicensed personnel required to man the planned reserve fleet.

ASSUMPTIONS:

The assumptions employed in the analysis are:

-- The manpower data and data sources are the same as those used for Appendices C-1 and C-2.

-- In the year 2000 analysis, all 507 commercial ships are assumed to be privately owned United States flag merchant ships with United States citizen crews.

-- Crew requirements for active and reserve ships in the year 2000 would be reduced to levels consistent with current trends in merchant ship manning. For example, for about two-thirds of the ships now in the RRF, newly revised ship manager contract manning levels provided by the Maritime Administration (MARAD) reflect reductions in crew sizes.

-- Merchant seamen fill active seagoing billets during peacetime at a ratio of 2.0 seamen per billet.

-- During mobilization, 90 percent of all actively sailing seamen would respond and would be available to man the active and reserve ships in the United States flag merchant fleet.

-- A person per billet ratio of 1.5 to 1, based on World War II experience, is required for sustained operations in a national emergency. Manning for the initial surge phase of a war at a ratio of 1.0 persons per billet on the reserve ships changes the year 2000 analysis, resulting in reducing the shortfall to 1,143 merchant seamen.

-- The 1988 manpower shortages exist only in the specific skill categories of radio officers and unlicensed deck and engine personnel (see Appendix C-1).

-- Billets should ideally be filled by trained, experienced, merchant seamen. If that standard were to be relaxed, some of the 1988 shortfalls in unlicensed manpower might be filled temporarily by entry level, minimally trained personnel. Additionally, surplus licensed officers could sail in unlicensed positions.

-- The United States Navy has not defined a clear future requirement for radio officers during mobilization. Radio officer billets have been included on currently existing ships, both active and reserve, but not on **ADD-ON SHIPS** for the year 2000. The calculations for radio officers are shown but were not used as a controlling factor in the analysis.

-- Billets should ideally be filled by trained, experienced, merchant seamen. If that standard were to be relaxed, about 600 to 700 billets (1,000 seamen) of the year 2000 shortfall could be considered entry level unlicensed deck, engine, and steward positions that might be filled by new, minimally trained personnel.

METHODOLOGY:

Two analytical tables entitled **MAXIMUM RESERVE FLEET SUPPORTED BY MANPOWER FROM ACTIVE MERCHANT SHIPS (ACTUAL - 1988)** and **MAXIMUM RESERVE FLEET SUPPORTED BY MANPOWER FROM ACTIVE MERCHANT SHIPS (COMMISSION GOAL - YEAR 2000)** follow.

Table 1, **ACTUAL - 1988**, reflects the current ships and seagoing labor pool using the billet and manpower data found in Appendix C-1.

Table 2, **COMMISSION GOAL - 2000**, projects the seagoing labor pool for the year 2000 as if the Commission's goal of a 650 ship United States flag merchant fleet, including 507 active commercial ships, had been attained. Both are in the same format, which consists of three sections:

Section I, **NUMBER OF BILLETS**, summarizes the peacetime and mobilization billet requirements for the active United States flag merchant ships found in Appendices C-1 and C-2.

Section II, **MANNING RATIOS**, shows the logic of the calculations to arrive at the per ship averages for billets and manning of the active and reserve fleets.

Section III, **CALCULATIONS OF SURPLUS OR (SHORTFALL)**, shows in summary form the **MAXIMUM NUMBER OF RESERVE SHIPS SUPPORTED**, based on the averages calculated for the "average" and "worst case" scenarios.

The data fields listed in the two analytical tables are:

SECTION I. NUMBER OF BILLETS

Summarizes the peacetime and mobilization billet requirements for the active United States flag merchant ships found in Appendices C-1 and C-2.

NUMBER OF SHIPS: The total number of ships by cargo carrying class. Data taken from Appendices C-1 and C-2.

LICENSED - DECK: Billet requiring a merchant seaman who is a specially trained and qualified officer holding a federal license for operation of unlimited tonnage upon oceans and is authorized to be employed aboard a United States flag merchant ship in a licensed capacity in the deck department (for example: as master, chief mate, second mate, or third mate). Data taken from Appendices C-1 and C-2.

LICENSED - ENGINE: Billet requiring a merchant seaman who is a specially trained and qualified officer holding a federal license for operating steam or diesel engines of unlimited horsepower and is authorized to be employed aboard a United States flag merchant ship in a licensed capacity in the engine department (for example: as chief engineer, first assistant engineer, second assistant engineer, or third assistant engineer). Data taken from Appendices C-1 and C-2.

LICENSED - RADIO: Billet requiring a merchant seaman who is a specially trained and qualified radio officer holding a Federal Communications Commission license and a federal license as Radio Officer and is authorized to be employed aboard a United States flag merchant ship in the capacity of radio officer. Data taken from Appendices C-1 and C-2.

UNLICENSED - DECK: Billet requiring a merchant seaman holding a Merchant Mariner's Document who is specially trained and qualified to be employed aboard a United States flag merchant ship in an unlicensed capacity in the deck department (for example: as able-bodied seaman, ordinary seaman, or boatswain). Data taken from Appendices C-1 and C-2.

UNLICENSED - ENGINE: Billet requiring a merchant seaman holding a Merchant Mariner's Document who is specially trained and qualified to be employed aboard a United States flag merchant ship in an unlicensed capacity in the engine department (for example: as oiler, fireman, watertender, or wiper). Data taken from Appendices C-1 and C-2.

UNLICENSED - STEWARD: Billet requiring a merchant seaman holding a Merchant Mariner's Document who is specially trained and qualified to be employed aboard a United States flag merchant ship in an unlicensed capacity in the steward department. Steward billets for peacetime manning of passenger ships have been reduced to include only food handling skills (for example: as cook, baker, or messmen). Billets for such personnel as bartenders, beauticians, entertainers, and other provides of hotel or passenger type services were excluded, since those skills would not be required on board ship during mobilization. Steward billets for mobilization manning of passenger ships converted to troopships have been further reduced to provide only for feeding the crew and for some supervising of the military food service teams provided by the embarked troops. Data taken from Appendices C-1 and C-2.

TOTALS: Sum of the number of billets for all commercial ships in a cargo carrying class.

TOTAL SHIPS & BILLETS - PEACETIME: Sum of the number of ships and the number of billets by column under peacetime conditions. Data taken from Appendices C-1 and C-2.

TOTAL SHIPS & BILLETS - MOBILIZATION: Sum of the number of ships and the number of billets by column under mobilization conditions. Data taken from Appendices C-1 and C-2.

SECTION II. MANNING RATIOS

Contains the calculations for the per ship averages for billets and manning of the active and reserve fleets.

AVERAGE BILLETS PER SHIP: The average number of **LICENSED** and **UNLICENSED** billets by category per ship and the average number of **TOTAL** crew per ship, calculated by dividing **TOTAL BILLETS - PEACETIME** for each category by **TOTAL SHIPS - PEACETIME.**

AVERAGE PEACETIME MANPOWER PER SHIP: The average number of available merchant seamen per ship, calculated by dividing **THE NUMBER OF TOTAL ACTIVE SEAMEN** from Appendix C-1 or Appendix C-2 by **TOTAL SHIPS.**

MOBILIZATION MANPOWER AVAILABLE: An estimate of the number of merchant seamen who would be willing and able to serve at sea in time of emergency, calculated by multiplying **AVERAGE PEACETIME MANPOWER PER SHIP** by .90. The 90 percent availability factor was used by the Navy in its 1986 Manpower Study.

MOBILIZATION MANPOWER REQUIRED: The manpower required to man the United States flag fleets during mobilization, calculated by multiplying **AVERAGE BILLETS PER SHIP** by 1.5, the men per billet ratio experienced for sustained operations during World War II and used by the Navy in its 1986 Manpower Study.

SURPLUS MOBILIZATION MANPOWER: Excess manpower, above that required to man active ships during mobilization and therefore available to man ships from the reserve fleets upon mobilization, determined by subtracting **MOBILIZATION MANPOWER REQUIRED** from **MOBILIZATION MANPOWER AVAILABLE.**

AVERAGE NUMBER OF BILLETS PER RESERVE SHIP: Calculated by dividing the data obtained from Appendices C-1 and C-2 respectively for the number of billets by category on reserve ships by the total number of reserve ships.

MOBILIZATION MANPOWER REQUIRED FOR RESERVE FLEETS: An estimate of manpower required to man the United States flag reserve fleets during mobilization, calculated by multiplying **AVERAGE NUMBER OF BILLETS PER RESERVE SHIP** by 1.5, the men per billet ratio experienced for sustained operations during World War II and used by the Navy in its 1986 Manpower Study.

ACTIVE/RESERVE RATIO: The ratio of the number of active ships needed to create a sufficient manpower pool to enable crewing a single reserve ship, calculated by dividing **MOBILIZATION MANPOWER REQUIRED FOR RESERVE FLEETS** by **SURPLUS MOBILIZATION MANPOWER.**

SECTION III. CALCULATIONS OF SURPLUS OR (SHORTFALL)

Shows in summary form the largest number of reserve ships that can be manned at the time of mobilization without regard to specific job skills, based on the averages calculated in Section II of the table. When specific job skills are taken into account, the largest number of reserve ships that can be manned at the time of mobilization is calculated under the worst case condition.

AVERAGE: Analysis based on the average **ACTIVE/RESERVE RATIO** for all categories of seamen calculated in Section II above.

WORST CASE: Analysis based on the largest **ACTIVE/RESERVE RATIO** by category calculated in Section II above, excluding radio officers.

TOTAL SHIPS: For **ACTUAL - 1988**, the number of United States flag merchant ships in the active and reserve fleets as of July 1, 1988. For **COMMISSION GOAL - YEAR 2000**, the projected number of United States flag merchant ships in the year 2000 assuming the Commission's goal of a 650 ship United States flag fleet is attained. **TOTAL SHIPS** is further divided into **ACTIVE SHIPS** and **RESERVE SHIPS**, actual and projected.

ACTIVE/RESERVE RATIO: The "average" and "worst case" values of **ACTIVE/RESERVE RATIO** from Section II above.

MAXIMUM NUMBER OF RESERVE SHIPS SUPPORTED: The maximum number of reserve ships that can be manned from the manpower pool created by the actual and projected active fleets, determined by dividing **ACTIVE SHIPS** by the **ACTIVE/RESERVE RATIO**.

SURPLUS (SHORTFALL) IN NUMBER OF RESERVE SHIPS SUPPORTED: The number of reserve ships that could not be crewed at mobilization because of a shortage of manpower, calculated by subtracting the **MAXIMUM NUMBER OF RESERVE SHIPS SUPPORTED** from the total number of reserve ships, actual or planned.

BILLET SHORTFALL: The projected number of unfilled billets determined by taking the appropriate AVERAGE or WORST CASE number from the **AVERAGE NUMBER OF BILLETS PER RESERVE SHIP** found in Section II and multiplying by **SHORTFALL IN NUMBER OF RESERVE SHIPS SUPPORTED**.

SEAMEN REQUIRED TO FILL THE SHORTFALL: The available manpower pool required to fill the **BILLET SHORTFALL** during mobilization, calculated by dividing **BILLET SHORTFALL** by the 90 percent factor.

Appendix E-12
Table 1
MAXIMUM RESERVE FLEET SUPPORTED BY MANPOWER FROM ACTIVE MERCHANT SHIPS
(ACTUAL - 1988)

	NUMBER OF SHIPS	LICENSED DECK	LICENSED ENGINE	LICENSED RADIO	UNLICENSED DECK	UNLICENSED ENGINE	UNLICENSED STEWARD	TOTALS
I. NUMBER OF BILLETS								
DRY CARGO	176	729	867	172	1,383	895	894	4,940
BULK/PASSENGER - PEACETIME	30	125	143	28	291	200	369	1,156
BULK/PASSENGER - MOBILIZATION	30	125	143	28	291	200	155	942
TANKER	203	830	856	180	1,551	834	730	4,981
TOTAL SHIPS & BILLETS - PEACETIME	409	1,684	1,866	380	3,225	1,929	1,993	11,077
TOTAL SHIPS & BILLETS - MOBILIZATION	409	1,684	1,866	380	3,225	1,929	1,779	10,863
II. MANNING RATIOS								
AVERAGE BILLETS PER SHIP		4.12	4.56	0.93	7.89	4.72	4.87	27.08
AVERAGE PEACETIME MANPOWER PER SHIP		8.78	10.45	1.89	17.03	10.21	12.07	60.44
MOBILIZATION MANPOWER AVAILABLE		7.90	9.41	1.71	15.33	9.19	10.87	54.40
MOBILIZATION MANPOWER REQUIRED		6.18	6.84	1.39	11.83	7.07	7.31	40.62
SURPLUS MOBILIZATION MANPOWER		1.72	2.57	0.31	3.50	2.11	3.56	13.77
AVERAGE NUMBER OF BILLETS PER RESERVE SHIP		4.15	4.31	1.00	9.86	6.29	5.30	30.99
MOBILIZATION MANPOWER REQUIRED FOR RESERVE FLEETS		6.22	6.46	1.50	14.79	9.43	7.95	46.35
ACTIVE/RESERVE RATIO		3.61	2.52	4.81	4.23	4.46	2.23	3.37

III. CALCULATIONS OF SURPLUS OR (SHORTFALL)

	AVERAGE	WORST CASE (Unlicensed Engine)
TOTAL SHIPS	510	510
ACTIVE SHIPS	409	409
RESERVE SHIPS	101	101
ACTIVE/RESERVE RATIO	3.37	4.46
MAXIMUM NUMBER OF RESERVE SHIPS SUPPORTED	122	92
SURPLUS (SHORTFALL) IN NUMBER OF RESERVE SHIPS SUPPORTED	21	(9)
BILLET SHORTFALL	-	(290)
SEAMEN REQUIRED TO FILL SHORTFALL	*	483

* Small shortage (175 seamen) currently exists to man RRF (see Appendix C-1).

Appendix E-12
Table 2
MAXIMUM RESERVE FLEET SUPPORTED BY MANPOWER FROM ACTIVE MERCHANT SHIPS
(COMMISSION COAL - 2000)

	NUMBER OF SHIPS	LICENSED			UNLICENSED			TOTALS
		DECK	ENGINE	RADIO	DECK	ENGINE	STEWARD	
I. NUMBER OF BILLETS								
DRY CARGO	100	404	435	99	658	385	399	2,380
BULK/PASSENGER	25	101	115	23	224	159	275	897
TANKER	92	381	394	75	666	305	311	2,132
ADD-ON SHIP	290	1,160	1,160	0	1,740	580	580	5,220
TOTAL BILLETS	507	2,046	2,104	197	3,288	1,429	1,565	10,629
II. MANNING RATIOS								
AVERAGE BILLETS PER SHIP		4.04	4.15	0.39	6.49	2.32	3.09	20.96
ACTIVE MANPOWER PER SHIP		8.07	8.30	0.78	12.97	5.64	6.17	41.93
MOBILIZATION MANPOWER AVAILABLE		7.26	7.47	0.70	11.67	5.07	5.56	37.74
MOBILIZATION MANPOWER REQUIRED		6.05	6.22	0.58	9.73	4.23	4.63	31.45
SURPLUS MOBILIZATION MANPOWER		1.21	1.24	0.12	1.95	0.85	0.93	6.29
AVERAGE NUMBER OF BILLETS PER RESERVE SHIP		4.10	4.25	0.99	9.36	5.85	4.93	29.49
MOBILIZATION MANPOWER REQUIRED FOR RESERVE FLEETS		6.16	6.38	1.49	14.03	8.78	7.40	44.23
ACTIVE/RESERVE RATIO		5.09	5.12	12.78	7.21	10.38	7.99	7.03

III. CALCULATIONS OF SURPLUS OR (SHORTFALL)

	AVERAGE	WORST CASE (Unlicensed Engine)
COMMISSION SHIP GOAL	650	650
ACTIVE SHIPS	507	507
RESERVE SHIPS	143	143
ACTIVE/RESERVE RATIO	7.03	10.38
MAXIMUM NUMBER OF RESERVE SHIPS SUPPORTED	72	49
SURPLUS (SHORTFALL) IN NUMBER OF RESERVE SHIPS SUPPORTED	(71)	(94)
BILLET SHORTFALL	(2,091)	(2,777)
SEAMEN REQUIRED TO FILL SHORTFALL	3,485	4,628

APPENDIX E-13

UNITED STATES SHIPYARD MOBILIZATION BASE

This appendix provides a historical account of the definition of the United States "Shipyard Mobilization Base" in 1982 and the evolution of that definition to the present. The numbers of shipyards, shipyard production workers, and total shipyard workers are frequently used as the indicators in analyzing the "Shipyard Mobilization Base." The Commission staff has observed that some government and private organizations, perhaps inadvertently, have tended to present the indicators in a contradictory or inconsistent fashion that has tended to obscure the actual status of the "Shipyard Mobilization Base."

For example, some government agencies or offices have concluded, on the basis of one presentation of the shipyard indicators, that there is a "surplus" of shipyard capacity in the United States. On the other hand, the Shipbuilders Council of America continues to report, based on a different presentation of the indicators, that the United States shipbuilding industry has shrunk to levels that currently jeopardize national security, and at the same time calls for the closing of two Naval shipyards.

An often-cited reference in any discussion of the United States "Shipyard Mobilization Base" is the Shipyard Mobilization Base (SYMBA) study, published in February 1984 with data as of October 1982, by the Assistant Secretary of the Navy for Shipbuilding and Logistics (ASN/S&L) and the Maritime Administration (MARAD), with support from several other government agencies. SYMBA was intended to examine the implications of a global conflict for the United States shipbuilding and ship repair base, serve as an input to maritime policy formulation, and act as a "datum" for recurring analyses.

The SYMBA study was followed by the National Defense Shipyard (NADES) study, which was commissioned to extend the analysis of the SYMBA study by evaluating the ability of a constrained shipyard base to accomplish defense related mobilization tasks. The NADES study utilized the SYMBA analysis for methodology and data, and limited its mobilization analysis to only an eight month period.

For a shipyard to be included in the SYMBA study, it had to meet one or more of the following criteria:

(A) Facility capable of constructing or drydocking to repair a vessel over 400 feet in length.

(B) Facility capable of topside repair (provided that the channel to facility is at least 12 feet) for vessels over 400 feet in length or shipbuilding or drydocking for vessels 150 to 400 feet in length.

(C) Capable of topside repair of ships over 400 feet (channel depth at least 12 feet) - no ways or docks.

The SYMBA study defined the "Shipyard Mobilization Base," as of October 1982, as consisting of 110 private shipyards, collectively employing 112,455 production workers, and 9 government shipyards, for a total of 119 shipyards. Table 1 lists the 110 private shipyards.

According to the Commission's data, in 1982 at least 20 additional private shipyards met the established criteria but were not included in the SYMBA "Shipyard Mobilization Base." Table 2 lists the 20 additional shipyards.

Inclusion of those 20 shipyards would have produced a "Shipyard Mobilization Base" that included 130 private shipyards collectively employing 114,455 production workers. Using recent information, derived from direct contact with and written verification from individual shipyards, and using the same criteria as the SYMBA study, the Commission defined the 1988 equivalent of the SYMBA "Shipyard Mobilization Base" as consisting of 103 private shipyards (down from 130), collectively employing 89,700 production workers (down from 114,455), and 9 government shipyards, for a total of 112 shipyards.

The Maritime Administration described the United States "Shipyard Mobilization Base" in its Major U.S. Shipbuilding and Repair Facilities 1987 Update of October 1987. Applying the criteria utilized in the SYMBA study, the Maritime Administration defined the private shipyard portion of the 1987 "Shipyard Mobilization Base" as consisting of 116 private shipyards collectively employing 115,340 total shipyard workers, of whom 80,317 were actual production workers.

The Shipbuilders Council of America (SCA) defined the private portion of the "Shipyard Mobilization Base," in its Manpower and Labor Issues Report of September 1988, to include 69 private shipyards collectively employing 103,940 total workers. To reach that number, the Shipbuilders Council analysis began with only the 110 private shipyards originally defined by SYMBA, and subtracted from that group the shipyards that had been closed or that no longer met the SYMBA criteria. The SCA also used the figure for total workers, instead of the figure for production workers. The Shipbuilders Council assumes a ratio of total to production workers in shipyards of roughly 1.3 to 1; on that basis, the 69 private shipyards collectively would have employed about 79,000 production workers in 1987.

The Commission staff approach to defining the "Shipyard Mobilization Base" was to develop a comprehensive shipyard data base by applying the same qualifying criteria as used in the SYMBA study. The Commission defined shipyard capability in three categories of shipyards: "core," "ancillary," and "other."

"Core" shipyards, which are the same as those meeting SYMBA criterion (a) and sometimes are called "full service" shipyards, are the most capable, with the ability to build or drydock at least the smallest practical militarily useful oceangoing vessel. That capability requires building ways or docking positions capable of accommodating a vessel at least 400 feet long and 68 feet in beam, and a minimum channel water depth of 12 feet.

"Ancillary" shipyards, which are the same as those meeting SYMBA criteria (b) or (c), have the capability to berth and repair vessels over 400 feet in length and with a 12 foot draft, but they can only accomplish some required mobilization tasks, such as the activation of Ready Reserve Force ships.

"Other" shipyards, which are shipyards not meeting any of the SYMBA criteria, lack either the operational facilities or the manpower to berth and work on ships of the required size and therefore have little or no capability to conduct mobilization tasks.

The results, documented in the Commission's first report and updated in its third report, are believed accurately to reflect the continuing decline of the United States "Shipyard Mobilization Base" in terms of shipyards, production workers, and shipyard facilities. Table 3 provides a summary of the United States shipyard industry as compiled by the Commission.

Table 4 provides a comparison of the shipyard tabulations compiled by the SYMBA study, the Maritime Administration, the Shipbuilders Council, and the Commission.

Table 1

SYMBA PRIVATE SHIPYARD MOBILIZATION BASE

EAST COAST

Allied Repair Service, Norfolk, Virginia
Atlantic Dry Dock Corp., Fort George Island, Florida
Bath Iron Works, Bath, Maine
Bath Iron Works, Portland, Maine
Bethlehem Steel, Sparrows Point, Maryland
Bethlehem Steel, Baltimore, Maryland
Boston Marine Industrial Park, Boston, Massachusetts
Boston Shipyard Corp., Boston, Massachusetts
Braswell Shipyards, Hoboken, New Jersey
Braswell Shipyards, Mt. Pleasant, South Carolina
Caddell Drydock & Repair, Staten Island, New York
Coastal Drydock & Repair, Brooklyn, New York
Colonna's Shipyard, Norfolk, Virginia
Detyens Shipyards, Mt. Pleasant, South Carolina
General Dynamics, Groton, Connecticut
General Dynamics, Quincy, Massachusetts
General Ship Corp., Boston, Massachusetts
Horne Brothers, Newport News, Virginia
Hudson Engineering, Hoboken, New Jersey
Jackson Engineering, Staten Island, New York
Jacksonville Shipyard, Jacksonville, Florida (includes Bellinger)
Jonathan Corp., Norfolk, Virginia
Maryland Shipbuilding & Drydock, Baltimore, Maryland
Metal Trades, Inc., Hollywood, South Carolina
Metro Machine Corp., Norfolk, Virginia
Moon Engineering, Norfolk, Virginia
Munro Drydock, Inc., Chelsea, Massachusetts
Newport News Shipbuilding, Newport News, Virginia (includes commercial sites)
Newport Shipyard, Newport, Rhode Island
Norfolk Shipbuilding and Drydock, Norfolk, Virginia
Pennsylvania Shipbuilding, Chester, Pennsylvania
Perth Amboy Drydock, Perth Amboy, New Jersey
Promet Marine Corp., East Providence, Rhode Island
Reynolds Shipyard Corp., Staten Island, New York
Robert E. Derecktor, Middletown, Rhode Island
Rodermond Industries, Jersey City, New Jersey
Savannah Shipyard, Savannah, Georgia
South Portland Shipyard, South Portland, Maine
Todd Shipyards, Brooklyn, New York
Tracor Marine, Inc., Port Everglades, Florida
Wiley Manufacturing, Port Deposit, Maryland

Table 1 (Continued)

GULF COAST

Alabama Drydock, Mobile, Alabama
American Marine Corp., New Orleans, Louisiana
Avondale Shipyards, Avondale, Louisiana (includes Westwego)
Bender Shipbuilding & Repair, Mobile, Alabama
Bethlehem Steel, Beaumont, Texas
Bludworth Bond Shipyard, Houston, Texas
Boland Marine, New Orleans, Louisiana
Buck Kreihs Co., New Orleans, Louisiana
Burton Shipyards, Port Arthur, Texas
Coastal Iron Works, Corpus Christi, Texas
Delta Shipyard, Houma, Louisiana
Dixie Machine Welding, New Orleans, Louisiana
Equitable Shipyards, Inc., New Orleans, Louisiana
Galveston Shipbuilding, Galveston, Texas
Geosource, Inc., Harvey, Louisiana
Gulf-Tampa Drydock, Tampa, Florida
Halter Marine, Chicasaw, Alabama
Hendry Corp., Tampa, Florida
Levingston Shipbuilding, Orange, Texas
Litton/Ingalls, Pascagoula, Mississippi (includes East and West Bank)
Marathon Le Tourneau, Brownsville, Texas
Marine Maintenance, Houston, Texas
McDermott Shipyard, Morgan City, Louisiana
Misener Industries, Tampa, Florida
Newpark Shipbuilding, Houston, Texas
Runyan Machine, Pascagoula, Florida
SBA Shipyards, Jennings, Louisiana
Tampa Shipyards, Tampa, Florida
Teh Tung Steamship, Houston, Texas
Texas Gulfport Shipbuilding, Port Arthur, Texas
Todd Shipyards, Galveston, Texas
Todd Shipyards, Houston, Texas
Todd Shipyards, New Orleans, Louisiana

WEST COAST

Atkinson Marine, National City, California
Campbell Industries, San Diego, California
FMC Corp., Portland, Oregon
Kaiser Steel, Napa, California
Lake Union Drydock, Seattle, Washington
Larson's Boat Shop, Terminal Island, California
Lockheed Shipbuilding, Seattle, Washington
Marine Power & Equipment, Seattle, Washington
National Steel, San Diego, California
Pacific Drydock, Oakland, California
Port of Portland, Portland, Oregon
Port of San Diego, San Diego, California
Rowe Machine Works, Seattle, Washington

Table 1 (Continued)

San Francisco Welding, San Francisco, California
Service Engineering Co., San Francisco, California
Southwest Marine, San Diego, California
Southwest Marine, San Pedro, California
Southwest Marine, San Francisco, California
Tacoma Boatbuilding, Tacoma, Washington
Todd Pacific Shipyards, San Pedro, California
Todd Shipyards, San Francisco, California
Todd Shipyards, Seattle, Washington
Tri-Marine Industries, Richmond, California
Triple A Machine, San Francisco, California
Triple A South, San Diego, California
West Winds, San Francisco, California
Zidell Explorations, Portland, Oregon

GREAT LAKES

American Shipbuilding, Lorain, Ohio
American Shipbuilding, Toledo, Ohio
Bay Shipbuilding, Sturgeon Bay, Wisconsin
Fraser Shipyards, Superior, Wisconsin
Marinette Marine Corp., Marinette Wisconsin
Peterson Builders, Sturgeon Bay, Wisconsin

NON-CONUS

Dillingham Shipyard, Honolulu, Hawaii
Pacific Marine, Honolulu, Hawaii
Puerto Rico Drydock, San Juan, Puerto Rico

Table 2

ELIGIBLE PRIVATE SHIPYARDS NOT IN SYMBA

EAST COAST

Associated Naval Architects, Portsmouth, Virginia
General Ship Repair Corporation, Baltimore, Maryland
Gowen, Inc., Portland, Maine
JOMAR Corporation of Tidewater, Suffolk, Virginia
M & W Marine Service, Inc., Norfolk, Virginia
North Florida Shipyard, Jacksonville, Florida
Steel Style, Inc., Newburg, New York
Swygert Shipyard, Inc., St. Johns Island, Florida

GULF COAST

Bollinger Machine Shop & Shipyard, Lockport, Louisiana
Coastal Marine Service of Texas, Corpus Christi, Texas
Fredeman Shipyard, Sulphur, Louisiana
Gulf Coast Fabrication, Pass Christian, Mississippi
Gulf Copper & Manufacturing Corp., Port Arthur, Texas
Textron Marine Systems, New Orleans, Louisiana

WEST COAST

Commercial Marine Service, Inc., Terminal Island, California
Foss Shipyard, Seattle, Washington
Southern Oregon Marine, Coos Bay, Oregon

GREAT LAKES

G & W Industries, Toledo, Ohio
H Hansen Industries, Toledo, Ohio
Nicholson Terminal & Dock Co., River Rouge, Michigan

Table 3

UNITED STATES SHIPYARDS, SHIP REPAIR FACILITIES, AND BOAT YARDS

	1982			1987			1988		
	SHIPYARDS	PRODUCTION WORKERS	FACILITIES*	SHIPYARDS	PRODUCTION WORKERS	FACILITIES*	SHIPYARDS	PRODUCTION WORKERS	FACILITIES*
CORE SHIPYARDS									
LARGEST PRIVATE	5	57,500	52	5	54,300	52	5	57,600	55
NAVAL	8	39,500	42	8	34,400	42	8	33,000	41
REMAINING CORE	67	55,100	171	41	26,900	113	44	23,900	109
TOTAL CORE SHIPYARDS	80	152,100	265	54	115,600	207	57	114,500	205
ANCILLARY SHIPYARDS **	66	12,100	1	63	7,500	1	56	8,700	2
OTHER SHIPYARDS	243	26,000	16	196	14,600	14	194	13,000	15
TOTAL ALL YARDS	389	190,200	282	313	137,700	222	307	136,200	222

* Facilities: building and docking positions capable of accepting a vessel 400 feet or more in length.

** Includes the Coast Guard Shipyard at Curtis Bay, Maryland.

Table 4

Shipyard Mobilization Base Comparison
(based on SYMBA study criteria)

	1982		1987		1988	
	Private Shipyards	Production Workers	Private Shipyards	Production Workers	Private Shipyards	Production Workers
SYMBA STUDY	110	112,455	--	--	--	--
Maritime Administration (MARAD)	110	108,437	116	80,317	--	--
Shipbuilders Council of America (SCA)	110	112,455	69	79,000	--	--
Commission on Merchant Marine and Defense (CMMD)	130	114,455	107	88,200	103	89,700

APPENDIX F

THE COMMISSION — ENABLING LEGISLATION

APPENDIX F

COMMISSION ON MERCHANT MARINE AND DEFENSE

Pub.L. 98-525, Title XV, Sec. 1536, October 19, 1984, 98 Stat. 2633, amended Pub.L. 99-145, Title XIV, Sec. 1431, Nov. 8, 1985, 99 Stat. 754; Pub.L. 99-426, Sept. 30, 1986, 100 Stat. 979:

(a) There is hereby established a commission to be known as the Commission on Merchant Marine and Defense (hereinafter in this section referred to as the "Commission").

(b) The Commission shall study problems relating to transportation of cargo and personnel for national defense purposes in time of war or national emergency, the capability of the United States merchant marine to meet the need for such transportation, and the adequacy of the shipbuilding mobilization base of the United States to meet the needs of naval and merchant ship construction in time of war or national emergency. Based on the results of the study, the Commission shall make such specific recommendations, including recommendations for legislative action, action by the executive branch, and action by the private sector, as the Commission considers appropriate to foster and maintain a United States merchant marine capable of meeting national security requirements. The recommendations of the Commission shall be provided in the reports of the Commission due 12 months after the date on which sufficient members of the Commission to constitute a quorum have been appointed and 24 months after such date, under subsection (g).

(c)(1) The Commission shall be composed of seven members as follows:

(A) The Secretary of the Navy (or his delegate), who shall be the Chairman of the Commission.

(B) The Administrator of the Maritime Administration (or his delegate).

(C) Five members appointed by the President, by and with the advice and consent of the Senate from among individuals of recognized stature and distinction who by reason of their background, experience, and knowledge in the fields of merchant ship operations, shipbuilding and its supporting industrial base, maritime labor, and defense matters are particularly suited to serve on the Commission.

(2) A vacancy in the Commission shall be filled in the manner in which the original appointment was made. Appointments may be made under paragraph (1)(C) without regard to section 5311(b) of title 5, United States Code [section 5311(b) of Title 5]. Members appointed under such paragraph shall be appointed for the life of the Commission.

(3) Four members of the Commission shall constitute a quorum, but a lesser number may hold hearings. The Commission shall meet at the call of the Chairman.

(d)(1) Members of the Commission appointed under subsection (c)(1)(C) may each be paid at a rate equal to the daily equivalent of the rate of basic pay payable for level IV of the Executive Schedule for each day (including travel time) during which they are engaged in the actual performance of the business of the Commission. Other members of the Commission shall receive no additional pay, allowances, or benefits by reason of their service on the Commission.

(2) A member of the Commission appointed under subsection (c)(1)(C) (who is not otherwise employed by the Federal Government) shall not be considered to be a Federal employee, except for the purposes of--

(A) chapter 81 of title 5, United States Code, relating to compensation for work-related injuries [section 8101 et seq. of Title 5]; and

(B) chapter 171 of title 28, United States Code, relating to tort claims [section 2671 et seq. of Title 28, Judiciary and Judicial Procedure].

(e)(1) The Commission may (without regard to section 5311(b) of title 5, United States Code)[section 5311(b) of Title 5] appoint an executive director, who shall be paid at a rate not to exceed the rate of basic pay payable for level IV of the Executive Schedule.

(2) The Commission may appoint such additional staff as it considers appropriate. Such personnel shall be paid at a rate not to exceed the rate of basic pay payable for grade GS-18 of the General Schedule under section 5332 of title 5, United States Code [section 5332 of Title 5].

(3) The executive director and staff of the Commission may be appointed without regard to the provisions of title 5, United States Code, governing appointments in the executive branch and may be paid without regard to the provisions of chapter 51 and subchapter III of chapter 53 of such title [sections 5101 et seq. and 5331 et seq. of Title 5] relating to classification and General Schedule pay rates.

(4) The Commission may procure temporary and intermittent services under section 3109 (b) of title 5, United States Code [section 3109(b) of Title 5].

(f)(1) The Secretary of the Navy and the Administrator of the Maritime Administration may detail personnel under their jurisdiction to the Commission in carrying out its duties under this section.

(2) The Secretary of the Navy and the Administrator of the Maritime Administration may provide to the Commission such administrative support services as the Commission may require.

(g) Not later than nine months after the date on which sufficient members of the Commission to constitute a quorum have been appointed and not later than 21 months after such date, the Commission shall submit to the President and to Congress a report containing its findings of fact and its conclusions. Not later that 12 months after such date and not later than 24 months after such date, the Commission, based upon those findings and conclusions, shall prepare a report containing the recommendations of the Commission as specified in subsection (b) and shall submit the report to the President and Congress. Each such report shall be prepared without any prior review or approval by any official of the executive branch (other than the members and staff of the Commission).

(h) The Commission shall cease to exist 90 days after the date on which the final report of the Commission under subsection (g) is submitted to the President and the Congress.

(i) There is authorized to be appropriated for fiscal years 1985, 1986, and 1987, a total of $1,500,000 to carry out this section. Any amount appropriated under this subsection shall remain available until 36 months after the date on which sufficient members of the Commission to constitute a quorum have been appointed.

COMMISSION ON MERCHANT MARINE AND DEFENSE

Commissioners:

Honorable Jeremiah Denton *Chairman, Former United States Senator*
Honorable John A. Gaughan *Maritime Administrator*
Honorable Edward E. Carlson *Chairman Emeritus, United Airlines*
Honorable William E. Haggett *President, Bath Iron Works Corporation*
Admiral James L. Holloway, III, USN (Ret.) *Former Chief of Naval Operations*
Honorable Joseph Sewall *Chairman, Board of Trustees, Maine Maritime Academy*
Honorable Shannon J. Wall *Executive Vice President, District No. 1 MEBA/NMU (AFL-CIO)*

Staff:

Dr. Allan W. Cameron, Executive Director
Captain Wayne I. Humphreys, USN, Chief of Staff

- Mr. Arthur D. Baker, III, Department of the Navy
- YN3 Ivory S. Bostick, USNR
- Commander Duane B. Bower, USN
- Lieutenant Mark Copman, USN
- Lieutenant Colonel Joseph L. Creasy, USA
- Ms. Carol A. Drohan, Department of the Navy
- Mr. Robert G. Elwell, Military Sealift Command
- Lieutenant Commander James H. Fenner, USN
- Lieutenant Christopher W. Grady, USN
- Commander Kathleen C. Gutierrez, USN
- Mrs. Claudia C. Holland, Maritime Administration
- Commander Bryan Hrabosky, Jr., SC, USN
- SGT Julie E. Mann, USMC
- Colonel Norman A. Mingle, USAF
- Captain Peter T. Muth, USCG
- Mr. Robert O. Nevel, Maritime Administration
- Mr. Mark D. Schaeffer, Naval Sea Systems Command
- Lieutenant Commander Robert N. Smith, USN
- YN2 Beth F. Snyder, USN
- Lieutenant Colonel Ky L. Thompson, USMC
- Captain Constantine Varelas, USNR

☆U.S. Government Printing Office: 1988-224-374:40310